DOCUMENT RESUME

ED 278 397 IR 051 756

TITLE	Annual Review of OCLC Research, July 1985-June 1986.
INSTITUTION	OCLC Online Computer Library Center, Inc., Dublin, Ohio.
PUB DATE	86
NOTE	56p.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	Advisory Committees; Annual Reports; Assistantships; *Bibliographic Utilities; Fellowships; Information Retrieval; Information Science; Information Technology; Program Descriptions; Publications; *Research and Development Centers; *Researchers; *Research Projects; Seminars
IDENTIFIERS	*OCLC; Visiting Scholars

ABSTRACT

This inaugural annual review provides an overview of the research activities and staff of the Online Computer Library Center, Inc. (OCLC) Offices of Research and Technical Planning. Information provided for the Office of Research includes the director's statement; photographs and biographical sketches of the Research Advisory Committee; brief summaries and more detailed reports of 13 current research projects, emphasizing electronic delivery mechanisms, access to bibliographic systems, and the application of advanced system technology to information access and delivery; a listing of publications; a listing of presentations and seminars; descriptions and application information for the visiting scholar, postdoctoral fellowship, and research assistant programs; summaries of the 1985-86 Distinguished Seminar Series presentations; and descriptions of collaborative programs and OCLC/Office of Research Funded Programs. The review of the activities of the Office of Technical Planning begins with the director's statement and includes descriptions of three programs concerned with technology assessment, technical standards, and internal consulting, and a listing of publications and presentations. Biographies and photographs of Offices of Research and Technical Planning staff members conclude the report. (KM)

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Annual Review of OCLC Research

July 1985–June 1986

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Foreword

The Office of Research and the Office of Technical Planning are separate, research-oriented areas of OCLC. The Office of Research carries out mission-oriented research. That is, its activities are directed toward helping OCLC and its members store, access, and use information more efficiently and effectively. The Office of Technical Planning serves a similar function; however, its principal focus is on the evaluation of new technologies to determine their importance to OCLC and its members. Each of these offices has a number of ongoing projects. For example, Office of Research projects include CD-ROM retrieval systems, the Electronic Information Delivery Online System (EIDOS, which will provide access to full monographs), and GraphText (an electronic publishing, browsing, and delivery system). Office of Technical Planning activities include assessments of optical storage equipment and software, including write-once and erasable devices and integrated mass storage systems.

Fiscal year 1985–86 was an eventful one for those of us engaged in OCLC research activities. Research staff members are now located at the Techmart facility, which is less than a mile from the OCLC Center. Martin Dillon, a former OCLC Visiting Scholar and professor of Library Science at the University of North Carolina, became the new director of the OCLC Office of Research, and the Research Applications group was established to help move OCLC's many research-related ideas through the stages of applied research to product development.

This inaugural edition of the *Annual Review of OCLC Research* provides you with an overview of ongoing research activities and the staff performing them. I am sure that you will agree that this is a productive, dynamic group of people who create an active, forward-looking environment. Since we can give you only a brief introduction to the research staff, their projects, and their project-related activities in a report of this kind, you are encouraged to contact members of the OCLC research staff directly for more information.

Michael McGill
Vice President
Research and Technical Planning

Office of Research

Director's Statement

From its founding, OCLC has been committed to improving the efficiency of library services through the application of innovative data processing practices and programs. OCLC further demonstrated its support of this commitment in 1977 by establishing a separate research department, chartered to advance the use of data-processing techniques in the fields of library and information science.

OCLC has long regarded research as a key element in the success of its broad, public mission of furthering ease of access to and use of the expanding body of worldwide scientific, literary, and educational knowledge and information. OCLC conducts in-house research aimed at developing and providing to the information community new products and services of significance which it regards as the natural result of fruitful research projects.

Today, an expanded Office of Research staff of nearly thirty research scientists, research assistants, and support personnel design and conduct mission-oriented research to provide the library and information science community with theoretical findings and practical applications. Some research projects lead directly to new products or services, while others yield new theories, algorithms, methodologies, and information models. Some related extramural research conducted at universities or other research centers is supported through an OCLC funding program.

The Office of Research has established these goals:

- To provide leadership to OCLC for the creation and enhancement of information-based products and services for the users of information
- To establish OCLC as a premier applied research organization in library and information services
- To provide research direction and education to the information community, including users, intermediaries, providers, secondary publishers, and information generators
- To identify, analyze, and synthesize current technological and research opportunities of importance to OCLC and the research community

Research results are shared with the library and information science community through presentations at professional meetings and seminars and publication of journal articles, conference proceedings, research reports, and monographs.

The OCLC Office of Research remains committed to improving access to information and, thereby, increasing the efficiency of libraries. To this end, the Office of Research will continue to conduct mission-oriented research to provide the library and information science community with new and useful applications of current programs, products, and services. We hope that you will find our efforts important to you as a member or potential member of the OCLC community.

Martin Dillon
Director
Office of Research

Research Advisory Committee

The Research Advisory Committee, composed of research advisors independent of OCLC, was established in the fall of 1984 to provide guidance and advice to the Office of Research. The committee evaluates current and proposed policies and projects in the context of OCLC's long-range and strategic directions. Foremost among the committee's reponsibilities is its role in analyzing the effectiveness of OCLC research activities and their relationship to current and future technologies.

Committee members are appointed to a three-year term. The current committee members are Robert Hayes, Dean, Graduate School of Library and Information Science, University of California at Los Angeles; Michael Lesk, Division Manager of Computer Science Research, Bell Communications Research; Brian Perry, Director of Research and Development, British Library; and Douglas Van Houweling, Vice Provost for Information Technology, University of Michigan.

Robert M. Hayes
Dean, Graduate School of Library and Information Science
University of California, Los Angeles

Dr. Hayes has been the dean of the Graduate School of Library and Information Science at UCLA since 1974. Before becoming dean, Dr. Hayes was a member of the school's faculty for ten years. He joined the faculty after fifteen years of experience in government and industry, working for such organizations as the National Bureau of Standards, Hughes Aircraft, National Cash Register, and Magnavox Research Laboratories. Dr. Hayes has been a visiting lecturer at American University, the University of Washington, and the University of Illinois at Urbana-Champaign. He has been active in professional societies, and in 1979/80 served as a presidential appointee on the Advisory Committee to the White House Conference on Library and Information Service. He chairs the Task Force of the National Commission on Libraries and Information Science, which is concerned with the interaction between public and private sectors with respect to information services.

Dr. Hayes has published extensively. He has served as editor for several scholarly publications, including the Information Sciences Series of John Wiley, for which he was the editor for fifteen years. He was an associate editor of the *Journal of the Association for Computing Machinery* for ten years.

Michael E. Lesk
Manager, Computer Science Research Division
Bell Communications Research

In 1969, Dr. Lesk joined Bell Laboratories where he worked for several years on the Unix system. He also wrote word processing programs, compilers, and networking code.

In 1981 he wrote an online public access catalog system for Bell Laboratories and code to distribute information from the Associated Press newswire and other data sources, such as weather services, census files, and airport lists. These programs were used to experiment with the relative advantages of menu and keyword interfaces to different systems.

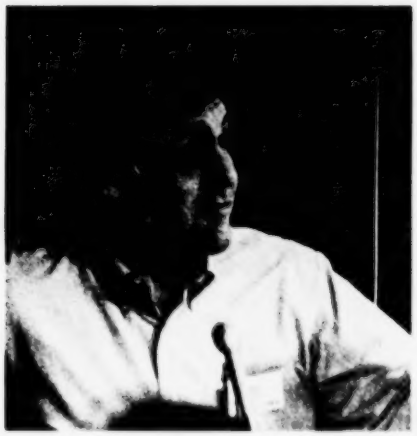
In 1983, Dr. Lesk became manager of the Computer Science Research Division at Bell Communications Research, Inc., in Morristown, New Jersey. His

personal research now involves machine-readable dictionaries and their use in information retrieval systems, including the use of dictionary definitions to resolve which sense of a word is intended in a particular context. This work is done in cooperation with the Centre for the New Oxford English Dictionary at the University of Waterloo.

Brian J. Perry
Director, Research and Development Department
British Library

Brian Perry was originally educated as a biologist and for a short period specialized as a plant taxonomist. He was also trained in the family business of nursery gardeners. However, fairly early in his career he entered the world of library and information work starting as an abstractor and indexer with the Technical Information Documentation section of the Department of Scientific and Industrial Research (DSIR). He was a member of DSIR Lending Library Unit, which was the planning body for the National Lending Library for Science and Technology—now known as the British Library Document Supply Centre. In the early 1960s, he was a founding member of the Industrial Liaison Group and was responsible for setting up industrial liaison centers in many parts of the United Kingdom. Since 1965, he has been mainly involved in research funding for library and information science and was a member of the Office for Scientific and Technical Information and transferred in 1975 to the Research and Development Department of the British Library, of which he has been director for the past five years.

Mr. Perry is a Fellow of the Linnean Society of London and of the Institute of Information Scientists. His major outside interests are horticultural science and the archaeology of the Bronze Age in the Aegean.



Douglas E. Van Houweling
Vice Provost for Information Technology
University of Michigan

Douglas Van Houweling is responsible for coordinating and developing the computing and telecommunications systems at the University of Michigan. These systems encompass several campuses, colleges, schools, and departments, and it is Dr. Van Houweling's goal to enhance the integration and coherence of information processing among these various units.

Dr. Van Houweling came to the University of Michigan from Carnegie-Mellon University, where he was Vice Provost for Computing and Planning from 1981 to 1984. In this capacity, he became nationally recognized for his direction of one of the most advanced and broadly distributed programs for the use of networked personal computers.

Dr. Van Houweling has also been active in interuniversity initiatives in computing and networking, and is a principal investigator for the Inter-University Consortium for Educational Computing.

Before joining Carnegie-Mellon, Dr. Van Houweling was with Cornell University from 1970 to 1981. He was assistant professor of government until 1976 when he became assistant director for User Services in Cornell Computer Services. In 1978, he was named director of academic computing and associate director of Cornell Computer Services.

Dr. Van Houweling received his undergraduate degree from Iowa State University and his Ph.D. in government from Indiana University. He has been a consultant to several organizations and written numerous articles on information systems planning, as well as urban politics and government policies.

Research Agenda

The current research agenda encompasses projects of immediate interest to OCLC's members, as well as projects with longer-range implications for OCLC, libraries, and information users. Topically, they can be categorized by their emphasis on electronic delivery mechanisms, access to bibliographic systems, and the application of advanced system technology to information access and delivery. User needs, an integral part of each project, are reflected in the development and results of each research effort. As the research needs of OCLC, libraries, and the information community dictate, new projects are added to the agenda. The research agenda for fiscal year 1985–86 was *Advanced Interface Design for Library Retrieval Systems, Automated Title Page Cataloging, Class Dispersion between the LC Classification and the DDC, Collection Analysis, CONSER Abstracting and Indexing Title Overlap, Dewey Decimal Classification Online Project, Display Formats, Electronic Information Delivery Online System (EIDOS), Graph-Text, Nonfiction Book Use by Public Library Users, OCLC CD-ROM Retrieval System, OCLC Database Use Analysis,* and *Subject Access.*

Project Summaries

Advanced Interface Design for Library Retrieval Systems

Of growing importance to libraries is the effective access to their catalogs by library patrons. At the same time, improvements in technology will soon make it feasible to access online catalogs using terminals that offer much greater capabilities than those currently in use. This project's goal is to explore innovative ways to use high-resolution screens and powerful workstations to improve the interface between online catalogs and library patrons. Major components of the project include an interface design language for creating interfaces to bibliographic retrieval systems, implementation of search expansion techniques, and formatting of bibliographic data for screen display.

Automated Title Page Cataloging

This project is designed to explore the feasibility of automated cataloging from title pages and other preliminary information (versos). The system is intended to process machine-readable page composition files of title pages and versos and generate a table of phrases and layout attributes (page location, style and size of font, and related information). A series of rules will then be applied to these data elements to attempt identification of the main elements of a bibliographic description.

Class Dispersion between the LC Classification and the DDC

The Class Dispersion project examines two measures that characterize the dispersion of a classification system when mapped to a second classification. One, a distance measure, captures the idea of the physical spread of a class from one system when represented in the second system; the second, from rank frequency analysis, characterizes the spread of a class among the classes in the second system. Such measures will tell us for any two classes which is more dispersed in a second system and, therefore, will allow us to order the classes in one system with respect to their dispersion in the second system. The application of such measures to the task of maintaining online catalogs might allow us to exclude classes from certain operations, say the automatic reclassification of bibliographic records.

Collection Analysis

Library Collection Analysis is based on subject indexes developed for the Subject Access project and will provide a methodology for evaluating the collection of a single library or a group of libraries by subject class. The results, a quantitative measure of a library's holdings in given subject areas, might serve as a basis for validating a library's conspectus entries, substantiating the effectiveness of a cooperative collection development agreement, or assessing a library's holding strengths.

CONSER Abstracting and Indexing Title Overlap

The goal of the CONSER Abstracting and Indexing Title Overlap project is to study and determine the coverage "overlap" of serials among the abstracting and indexing services within the CONSER project. The CONSER project was originally cosponsored by the Association of Research Libraries (ARL) and the National Federation of Abstracting and Information Services (NFAIS) to add abstracting and indexing information to the CONSER database, which is operational in the OCLC® Online System. This provided a link between library catalogs and A&I service citations, enabling researchers to determine where serials of interest are indexed and facilitating access to high-demand series.

Dewey Decimal Classification Online Project

The research team of the Dewey Decimal Classification Online project demonstrated that an online catalog enhanced with subject information from the DDC improved subject access, subject searching strategies, and the display of subject-rich information in libraries' bibliographic records. In the research project, subject-rich terms from the DDC Schedules and Relative Index were incorporated into an online catalog as searchers' tools for subject access, browsing, and display. The machine-readable DDC used in this project was converted from the print tapes that originally served to produce the nineteenth edition of the printed *DDC* using computerized photocomposition.

Display Formats

The goals of the Display Formats project are to develop basic experimental methods for evaluating human-computer interfaces and refine experimental evaluation techniques and capabilities for user and system performance measurement. Human factors issues as they relate to the interface design of information systems are also being explored. This project is divided into two parts: (1) determining the impact on user search time of such factors as multiwindowing and (2) understanding the relevance assessment and item selection process used by library patrons.

Electronic Information Delivery Online System (EIDOS)

The Electronic Information Delivery Online System project staff is designing and developing an information system to provide online access to the complete text and graphics contained in documents, beginning with books. As a part of this project, tables of contents and back-of-the-book indexes will be searchable to aid users in finding information.

Graph-Text

Through the Graph-Text project, the Office of Research explores new electronic methods of information transfer from the publisher to the library user. The project encompasses a range of activities, from the investigation of telefacsimile transmission to low-cost, on-demand printing and display systems utilizing sophisticated character generation and typesetting systems. The project uses some of the most advanced hardware and software available for electronic publishing. Information is stored on optical disks, and laser printers are used as output devices. A primary goal of the project is to maintain hardware independence. The Graph-Text project represents a cluster of innovations intended to make electronic document delivery a viable and appealing alternative for libraries.

Nonfiction Book Use by Public Library Users

This project, which investigates how library patrons use nonfiction books, was prompted by the needs of the Electronic Information Delivery Online System (EIDOS), the objective of which is to provide information to users when and where they need it. The EIDOS concept assumes that substantial use of books is made for obtaining or consulting information or ideas, and that, generally, nonfiction books are not read completely, but only in parts. This project tests these assumptions and attempts to find answers, or at least partial answers, to such questions as these: Who uses the information in nonfiction books? After locating a specific book, what clues do these users employ to find information in that book? In what context (e.g., home or work) and how soon do users use the information? What is their perception of the importance of the information?

OCLC CD-ROM Retrieval System

The OCLC CD-ROM Retrieval System project was initiated to explore the emerging technology of optical data storage. The project's goal is to provide OCLC members with a series of information retrieval products based on this technology. The primary goal of the first phase of the project was to develop a prototype reference workstation. The prototype consists of two main parts: the "search engine," which contains low-level subprograms providing access to the database, and the user interface, which permits the user to invoke the functions of the search engine and manipulate the results for viewing or printing.

OCLC Database Use Analysis

The purpose of this project is to determine one or more appropriate subsets of the OCLC Online Union Catalog that could be distributed to library workstations for local cataloging purposes. To achieve the project's purpose, two primary research questions were asked: (1) What is the frequency with which libraries use newly input cataloging records over a period of 10–14 weeks? Is there high use at first, followed by a drop-off period? When does high use occur? (2) What types and sizes of libraries use current cataloging records? This project will be a first step toward determining one or more appropriate database subsets that might be placed on optical storage discs for cataloging purposes.

Subject Access

The research team of the Subject Access project investigated problems related to providing subject access to the OCLC Online Union Catalog. This project encompassed two major activities: (1) the development of indexes to support subject searching of the Online Union Catalog using complete subject headings, and (2) the correction of common errors in subject headings.

Project Reports

Advanced Interface Design for Library Retrieval Systems Project

Project Manager: Martin Dillon, *Director, Office of Research*
Project Staff: Brigitte Kenney, *Research Scientist;* Bruce Mortland, Karen Rankey, and Anthony Repka, *Programmer/Analysts;* Debra Pawlicki, *Research Assistant*

The Advanced Interface Design for Library Retrieval Systems project was initiated because of the growing importance of effective patron access to library catalogs. At the same time, improvements in technology will soon make it feasible to use as online catalog terminals devices that have much greater capabilities than those currently in use. To anticipate the availability of such devices in libraries, this project is investigating methods of providing facilities for the creation of interfaces to retrieval systems on devices with large, high-resolution screens, powerful microprocessors, and multiple input capabilities.

Through the development of an interface design language and an appropriate environment in which to operate, the project aims to provide interface designers with a tool to do rapid prototyping to experiment with new ideas. A less immediate, but no less important, objective is to provide library specialists who are not necessarily programmers with a means of modifying easily and quickly as many aspects of the interface as possible. Achieving the second aim would lead to easily adaptable systems that we view as intermediate to the far more ambitious aim of developing systems that are adaptive, transforming themselves through experience with users.

Work on the project has dealt mainly with the design of an interface for the retrieval of bibliographic records. The retrieval of bibliographic records is a suitable application for investigating interface design problems because it combines largely naive users with a challenging intellectual problem. Add to this mix a workstation with a screen capable of displaying large amounts of information, the interface design becomes an evolutionary process rather than the creation of a single, static system.

The major component of the project is D, a language for creating interfaces to bibliographic retrieval systems, such as DIALOG or BRS, and online public access catalogs (OPACs). Primary features of the D language are a simple conceptual structure reflected in a simple syntax, procedure calls for invoking application actions, and a generalized formatting scheme for the display of information to the screen. A simple structure based on states and transitions among states is the D language's primary characteristic. To the designer, a state is an event, such as input from a patron or the completion of a retrieval by the system, which requires that the designer specify to the system what will happen next. To the system user, a state is usually perceived as a pause in the system action as displayed in one of the screen windows, which requires some input from the user before the system can continue.

Methods are also being investigated in the project that will produce more successful searches for the library patron. The basic technique allows records from a search to be used to produce a subsequent search for similar records on the contents of one or more of the fields in the target record. The fields that may be used include LC class number, title, and subject heading. Records retrieved using the refined search are presented to the patron in an order ranked by their likelihood of similarity to the target record.

The long-term OPAC environment calls for facilities to interactively view and edit a D program by viewing a particular state, state diagram, and overview of the program simultaneously.

The D language is capable of handling different kinds of interfaces (menu, icon, command), a variety of interface devices (keyboard, mouse), and interactions in a multiwindow environment. It also allows the system designer to specify a parser so that a searcher's language may have a grammar that differs from that of the search software. The facilities provided by the D language allow the designer to quickly change the interaction of the system with the user. This is all accomplished in a language that allows the designer to express the design in high-level terms and not be concerned about low-level details.

Further editing features call for the editing and saving of retrieved records or a previously saved user file. Other desired facilities include providing patrons with the ability to interactively enter notes while using the system. An interactive debugging environment is likely necessary for experimentation of system flow control and displaying of menus and messages.

Automated Title Page Cataloging

Project Manager: Stuart Weibel, *Associate Research Scientist*
Project Staff: Diane Vizine-Goetz, *Research Scientist;* Mike Oskins, *Associate Scientist;* Craig Henderson, *Research Assistant*

The centralization of technical services and the creation of bibliographic networks, such as OCLC, have done much to improve library services. Shared cataloging has made cataloging faster, more efficient, and less labor intensive. Despite these advances, cataloging remains a resource-intensive activity, requiring experience and skills that are becoming scarcer. Recent evidence suggests that the pool of qualified catalogers is decreasing significantly. Thus, efforts to further automate the cataloging process are particularly appropriate at this time and are pertinent to OCLC's goal of reducing the rate of rise of library per-unit costs.

While few attempts have been made to automate cataloging activities, recent international efforts demonstrate increased interest in this area. Researchers in England, Germany, and Sweden have initiated research activities related to automated cataloging, and several efforts in this country are currently underway.

The Automated Title Page Cataloging project will attempt to show the feasibility of developing an automated cataloging system. The input to the system will be machine-readable files containing information from title pages and versos. In a production environment, these files might be generated directly from publishers' photocomposition tapes or from advanced character recognition systems. A system of this type, therefore, would be useful for both newly published and older materials.

In May 1986, a test sample of materials was selected from a constrained random sample of records taken from the Online Union Catalog, OCLC's bibliographic database. The subset consisted of English language monographs. Items were restricted to English language monographic material to keep the demonstration system more manageable. This is a reasonable restriction, since monographic records account for 84.3% of the OCLC database; of these, 70.8% are for English language works.

The output of the system will be a first-level bibliographic description as defined by the *Anglo American Cataloguing Rules,* Second Edition (AACR2). Limiting the output to a first-level description reduces the number of AACR2 rules to a number appropriate to this preliminary study. Success at this level would provide the foundation on which to build a system of broader scope. The first-level description can serve as a basis for more detailed levels. That is, the second-level description includes all of the information required in the first-level description, and so on.

The conceptual model for this system is best described as a backward-chaining, rule-based expert system. A rule-based model is simply a system in which some measure of human expertise has been captured in a set of rules that may include both algorithmic (or computational) and rule-of-thumb (or heuristic) reasoning. It is backward chaining in the sense that the program identifies a goal and searches for conditions that satisfy it.

The logic-based programming language PROLOG will be used, primarily because of its foundations in predicate calculus (PROLOG incorporates a built-in inferential capability that facilitates deductive reasoning) and the ease with which the rules can be separated from the procedural components of the application. This modularity of data (rules) and procedures is easier to achieve than in traditional procedural languages. The result is a set of rules that are more easily maintained; rules can be added or modified without altering the procedural code that applies to them.

The rules are expected to fall into these categories:

1. **Layout rules.** Rules of thumb pertaining to clues about content derived from page location, font styles, and font sizes.
2. **Key phrase rules.** Heuristics concerning the occurrence of specific words or phrases likely to be encountered in the sample.
3. **Semantic rules.** Rules based on the meaning of phrases or words encountered in the title page.

The proposed system will provide statistics concerning the results of the application of specific rules. This information will be used to improve and document the performance of the system. It is conceivable that an advanced system based on this approach would use statistics on rule usage to "learn" from experience and modify the system's performance accordingly.

The potential benefits of automated cataloging include increasing productivity of catalogers and enhancing online catalogs. In addition, it is increasingly evident that artificial intelligence techniques, which are moving from the laboratory to the marketplace, have a role in future information retrieval and management.

Class Dispersion between the Library of Congress Classification and the Dewey Decimal Classification Project

Project Manager: Diane Vizine-Goetz, *Research Scientist*
Project Staff: Martin Dillon, *Director, Office of Research;* Edward O'Neill, *Senior Research Scientist*

The class dispersion project examines two measures that characterize the dispersion of a classification system when mapped to a second classification. One, a distance measure, captures the idea of the physical spread of a class from one system when represented in the second system; the second, from rank frequency analysis, characterizes the spread of a class among the classes in the second system.

Such measures will tell us for any two classes which is more dispersed in a second system and, therefore, will allow us to order the classes in one system with respect to their dispersion in the second system. Such an ordering would enable us to identify and investigate those subject areas in the two systems that are most unlike. This in turn will allow us to form generalizations about the differences in the conceptual bases of the two systems. The application of such measures to the task of maintaining online catalogs might allow us to exclude classes from certain operations, say the automatic reclassification of bibliographic records.

A further application is to understand the consequences for retrieval of the dispersion of the classification systems with respect to one another. The basic question is: Are there patron needs, queries, or retrieval situations that would be better served by one classification rather than another? Alternatively, are there retrieval needs where the simultaneous use of both systems would improve results, or is the degree of redundancy between the two systems such that one alone will suffice? Of course, the answers to such questions usually vary depending on the topic or region of the schedule that one is concerned with.

The measures are tested by applying them to the library science portions of the Library of Congress Classification (LCC) and the Dewey Decimal Classification (DDC) using a database drawn from MARC records.

The results indicate the two dispersion measures are effective in identifying classes that map badly and classes that map well between the two systems. By this we mean that classes scoring high on both measures map poorly in an obvious sense—each is highly dispersed in the second system. On the other hand, classes scoring low map well—the class structure of each is largely retained in the second system. Two tasks remain. The first is to further clarify the meaning of classes that score in the extreme range of one of the measures but not the other. The second is to determine whether classes that map well or badly in the above sense are not identified by the measures. This would happen if classes falling in the middle ranges of either or both measures nevertheless qualified as good or bad.

It was decided that both of these questions were best left to a follow-up study for two reasons. The first has to do with the restricted subject range of the sample used for this study; the second has to do with a need to define further the use to which these measures would be put.

With respect to the restricted subject range, while nothing in the character of the sections of the library science schedule suggests they are especially skewed with respect to the issues being explored here, no single section is likely to reflect the complete classification in all respects. Thus, it was decided to pursue these anomalies in the larger context of the complete classification. This requires application of the measures to the full LC MARC Class File, a study which is now underway.

The second reason for not exploring further the implications of the two measures, the specific use to which they will be put, arises from the following contrast in two possible applications: (1) conversion from one classification to the other and (2) broadening a search in a retrieval environment.

In conversion, one has an item classified in one system, say LCC, and wishes to identify the best DDC class in which to put the item based on the dispersion of the class in DDC. A simple rule is to place it in the class which appears most frequently among those in its class. While there are no serious competitors to this simple rule, it has these deficiencies: (1) the effectiveness of the choice will vary greatly depending on the class and (2) deciding when the choice cannot be made automatically using the simple rule is not an easy one. A reasonable hope is that the two measures can combine to guide this decision.

Similar uncertainties arise in a retrieval context. The question here is clearest when a patron identifies a specific item in one classification, and the problem is to decide if transferring to the other classification system will be beneficial. The answer is likely to depend on the precise needs of the patron and also on the dispersion properties of the classes involved.

These contexts provide two directions for this research to take, but both depend on applying these measures across the complete classifications and conclusions based on analyzing those results.

Collection Analysis Project

Project Manager: Edward O'Neill, *Senior Research Scientist*
Project Staff: Nancy Sanders, *Research Scientist;* Stuart Weibel, *Associate Research Scientist*

The primary objective of the Collection Analysis project is to assess the feasibility of analyzing library collections using the holdings and bibliographic data available in the OCLC Online Union Catalog.

The project began with the encouragement of the OCLC Research Libraries Advisory Committee (RLAC) Task Force on Collection Development, which wanted to reduce the labor intensity of the verification process in collection analysis, particularly that associated with the Association of Research Libraries' North American Collections Inventory project.

Other potential uses for the data include reports to accrediting agencies (e.g., impact statements for governing bodies citing collection strengths and weaknesses in subject areas relevant to proposed program/course development); reports giving the relative strength of a library's collection for use in grant applications; overlap studies for libraries considering cooperative collection development agreements; and the development of bibliographies by format, subject, date, etc.

Fortuitously, at the time the project was developing, the science bibliographers in institutions belonging to the Committee on Institutional Cooperation (CIC) planned a meeting to discuss the potential for cooperative collection development. (The CIC is composed of the Big Ten universities and the University of Chicago.) As the CIC program planners were amenable to participation in the Collection Analysis project, the research team proceeded with the feasibility study using the sci-tech collections of the OCLC/CIC members as the database. The collections analyzed were those of the universities of Illinois, Indiana, Michigan State, Ohio State, Purdue, and Wisconsin. The subject categories sampled were mathematical analysis (calculus) and botany.

To date, the project team has (1) collected and analyzed the one-thousand-record sample for overlap, uniquely held items, and other characteristics of the calculus and botany collections of the OCLC/CIC institutions; (2) coordinated online analysis of the same subject areas for the CIC/RLG libraries with the Research Libraries Group (RLG); (3) coordinated validation of the online analyses by the participants (each CIC library checked the OCLC or RLG analysis of its holdings by searching the one-thousand-record sample against its local catalog); (4) reanalyzed the "validated" data for overlap, uniqueness, etc.; and (5) initiated the final report.

Although the interpretation of results is not yet complete, it is clear that collection analysis on a large scale would be problematic given existing database quality, configuration, and local cataloging practices, which, taken together, result in a need for excessive human intervention to complete an analysis with acceptable reliability.

CONSER Abstracting and Indexing Title Overlap Project

Project Manager: John E. Tolle, *Research Scientist*
Project Staff: Karen Rankey, *Programmer/Analyst*

The goal of the CONSER Abstracting and Indexing Title Overlap project is to study and determine the coverage "overlap" of serials among the abstracting and indexing services within the CONSER project. The CONSER project was originally cosponsored by the Association of Research Libraries (ARL) and the National Federation of Abstracting and Information Services (NFAIS) to add abstracting and indexing information to the CONSER database, which is operational in the OCLC Online System. This provided a link between library catalogs and A&I services citations, enabling researchers to determine where serials of interest are indexed and facilitating access to high-demand series.

Included within the project are 116 abstracts and indexes. Specifically, quantitative analysis was used to determine overlap between and among A&I services at the title level along with a content analysis. The total number of records included was 46,683. Data was collected from the Tandem system and transferred to the Apollo system in the Office of Research, and statistical analysis programs were written to define (1) degree of coverage of services, (2) any coverage overlap of services, (3) full coverage overlap, (4) degree of overlap, (5) service profiles, (6) summary statistics, (7) subject content by service, and (8) services by subject content.

Descriptive statistics produced included the number of services and what they are; the number of times a "limit" was reached on a MARC record (the 510 field, which represents the service); records with one, two, or more 510 fields; number of records for a given service; total number of 0, 1, and 2 coverage 510 fields (0 = unknown coverage, 1 = complete coverage, 2 = selective coverage); total number of 510 fields with and without ISSN; distribution parameters; and rank ordering of lists.

Service profiles included records with one, two, or more 510 fields (both numbers and percentage of service coverage, pairwise comparisons of services, LC subject comparison, e.g., physics, music, etc., and other statistics that help to describe a profile of the A&I service).

The results of the project are being shared with both the CONSER project in Washington, DC, and NFAIS to obtain their suggestions on what may be most useful both to them and A&I services.

Dewey Decimal Classification Online Project

Project Manager: Karen Markey, *Research Scientist*
Project Staff: Anh Demeyer, *Systems Analyst;* Jeffrey Gerckens, Daryl Poe, and Ralph Gott, *Research Assistants*

The Dewey Decimal Classification (DDC) Online project was supported by the Council on Library Resources, OCLC, and Forest Press (publisher of the DDC). In the research project, subject-rich terms from the DDC Schedules and Relative Index were incorporated into an online catalog as searchers' tools for subject access, browsing, and display. The machine-readable DDC used in this project was converted from the print tapes that originally served to produce the nineteenth edition of the printed *DDC* using computerized photocomposition.

Four features of the DDC were employed to help searchers browse for and match their own subject terms with the online catalog's terminology: (1) subject terms in the DDC Schedules (e.g., headings, scope notes, class here notes, and including notes), (2) hierarchical arrays of related terms in the DDC Schedules, (3) subject terms in the DDC Relative Index, and (4) class numbers in the DDC Schedules and Relative Index. Using the expanded subject information from these sources, users of the experimental online catalog had a greater chance of finding exactly the topic they were seeking.

The effectiveness of the DDC in an online catalog was tested in online retrieval experiments with library patrons and staff at the Library of Congress, the New York State Library, the Public Library of Columbus and Franklin County (Ohio), and the Mathematics Library of the University of Illinois at Urbana-Champaign. The online retrieval tests provided data and analyses to answer the following three research questions:

1. Is the machine-readable DDC suitable to implement in an online catalog as a searcher's tool for subject access, browsing, and display?
2. When used as a searcher's tool for subject access, browsing, and display, does the online DDC improve the search performance of subject searchers at the online catalog?
3. Do subject searchers prefer an online catalog in which the DDC is available as a searcher's tool to an online catalog without online DDC?

The DDC Online project demonstrated that the DDC can be a searcher's tool for subject access, browsing, and display in an online catalog. The addition of unique subject-rich terms from the DDC enhanced subject access to the online catalog. The DDC provided new strategies for subject searching and browsing that were not possible through the alphabetical approaches of subject headings and/or keywords presently supported by online catalogs. The DDC enhanced the display of subject-rich information in bibliographic records and in displays of the bookshelf areas where retrieved items in online searches were located.

The research findings of the DDC Online project addressed chiefly subject searchers' use of a library classification in the information retrieval environment of an online catalog. The findings provided insight into searchers' problems with online displays of the DDC Schedules and Relative Index, bibliographic record displays enhanced with subject information from the DDC, and online catalog capabilities necessary to support searching, displaying, and retrieving library catalog and classification information. As a research project studying online catalog use, the DDC Online project furthered our general knowledge of library patron use of online catalogs, regardless of the extent to which these catalogs have been enhanced by a library classification. These research findings addressed the interests of the project participants involved in the construction and maintenance of the DDC, viz., Forest Press and the Decimal Classification Division of the Library of Congress, library administrators involved in decision making about enhancements to a library's online catalog, and library staff and technical systems staff involved in the design and implementation of an online catalog in general and, specifically, of a library classification in an online catalog.

Display Formats Project

Project Manager: John E. Tolle, *Research Scientist*
Project Staff: Karen Rankey, *Programmer/Analyst;* Ralph Gott and Michael Prasse, *Research Assistants*

The goals of the Display Formats project are to develop basic experimental methods for evaluating human-computer interfaces and refine experimental evaluation techniques and capabilities for user and system performance measurement. Human factors issues as they relate to the interface design of information systems are also being explored. This project is divided into two parts: (1) determining the impact on user search time of such factors as multiwindowing, and (2) understanding the relevance assessment and item selection process used by end users (libraries and their patrons).

One objective of the experiments was to determine user efficiency under varying conditions of interaction. For example, sequential presentation menus require the users to make more decisions, but simultaneous presentation of menus result in a more cluttered screen; thus, these factors affect the user's efficiency.

The impact of variations in length of menu, menu system configuration, and number of displayed windows on user search time was investigated. The subject's task was to locate a predesignated target item (e.g., robin) in either of two menu configurations. In the Menu Heading condition, one-line headings identifying general item categories (e.g., Living Things) were initially displayed. A different heading was presented in each of several windows, and the initial selection by the subject determined the window in which subsequent menus were presented. Menus of corresponding subcategory items (e.g., types of birds) were then sequentially selected by the subject and displayed in this window until the target item was located.

In the Menu Display condition, the same headings were again presented initially, but simultaneously displayed beneath each of these headings was the first list of corresponding subcategory items. The subject then proceeded as in the Menu Heading condition. The number of windows presented in a trial (two or three) and the number of items within each menu (nine or thirteen) were varied. The time from target designation to initial menu/window selection was measured, as was the time to select each subcategory menu. The results indicated that subjects were equally fast in their initial menu/window selection regardless of the menu condition, i.e., Menu Heading or Menu Display. In addition, increasing the number of windows displayed from two to three resulted in an average increase of 490 milliseconds in the initial window selection time; however, this effect did not interact with the type of material displayed in the windows.

Another objective of the experiments was to determine the impact on relevance assessment as more items are presented and the time it takes a user to assess an item's relevance.

In any information retrieval system, items are displayed in some form for a user who must then select items that he feels are relevant to his query. A study of this process of relevance assessment and item selection could answer several basic questions. For example, does a user become less sensitive to relevance as he examines more items? If this is true, then a user may miss potentially relevant items that fall at the end of the retrieved list. Such a result would suggest the need for systems which can order retrieved items by some approximation of relevance. Any lessening of sensitivity to relevance may also depend on the density of relevant items within the display. If there were many relevant items per screen, the user may initially select many items and, feeling that a sufficient number have been selected, might become even less likely to select more items.

In addition to these issues of "relevance sensitivity," this study may also answer other questions about the relevance assessment and item selection process. For example, the time to assess an item's relevance can be found by comparing the time spent on a page in the item selection study with the time required merely to read the items on a page.

A study of relevance assessment and item selection may also lead to new methods for evaluating the human-computer interface within an information retrieval context. Potential users could be given unlimited time to select relevant items from paper listings. This "paper" condition can serve as a standard control for other computer display conditions. If, in a computer display condition, users differ in their relevance judgments from the users in the "paper" condition, this difference could be attributed to the interface. In this way, different interfaces could be characterized by their effect on the item selection process. Thus, the present study will allow us to develop the basic experimental methods that can later be extended to the evaluation of human-computer interfaces.

Because of their windowing capabilities, SUN Workstations® are being used to explore these and other human factor and user interface questions. These studies will add substantially to experimental and research methodologies through the development of quantitative evaluation techniques in the areas of human factors and search behavior.

Electronic Information Delivery Online System (EIDOS) Project

Project Manager: Betsy N. Kiser, *Manager, EIDOS Development*
Project Staff: Frederick Kilgour, *Principal Investigator;*
Igor Zuyev, *Systems Analyst I;* Mark Basham, *Programmer III*

The Electronic Information Delivery Online System (EIDOS) developed and implemented at OCLC provides access to texts from microcomputers. The purpose of EIDOS is to make information available to people when and where they need it. The system is currently focusing on information customarily found in book form.

EIDOS uses the digital representation of the text from which the printed version of the book is prepared. The widespread use of personal computers and word processors to prepare manuscripts has created the environment for EIDOS. A text in machine-readable form, although requisite, is not sufficient to permit access to that text through EIDOS. A number of manual alterations and additions are necessary before the EIDOS computer programs can incorporate the text into the database. The database consists of multiple files, such as those for title, table of contents, back-of-book index pages, and page numbers.

OCLC will maintain the text centrally while local libraries will embed into their online public catalogs EIDOS-prepared keys for access, index, table of contents, and title. These locally embedded entries will have computer pointers back to the centrally located text. This arrangement will permit local searching for a document and browsing of the table of contents and index pages, thereby circumventing long-distance communications charges until the actual text is requested.

Access to the documents in EIDOS is currently through the use of derived, truncated search keys for author, author/title, and title. Future access via natural language queries is intended but will require extensive research before incorporation into EIDOS.

EIDOS is operational as a prototype with two documents available online and is progressing from the prototype stage to development of a fully operational system. Knowledge gleaned from other projects, new and old, at OCLC is an important resource for the design and development of EIDOS. Functional specifications describing the requests users will make of the system and a preliminary overall system design, including telecommunications, have been defined. Programs are being developed to translate various digitized formats received from publishers into a common format for inclusion in the EIDOS database.

A six-month field test is planned to start in early 1988.

Graph-Text Project

Project Manager: Thomas Hickey, *Senior Research Scientist*
Project Staff: John Handley, Richard Hale, and Lora Nelson, *Programmer/Analysts;* Jeffrey Gerckens, Sehchang Hah, Susan McCabe, and Amy Rhine, *Research Assistants*

The Graph-Text Project is a joint effort by the Office of Research and the Product Development Division of OCLC to develop a prototype electronic document delivery system. The system is designed primarily with scientific, technical, and medical journal articles in mind. The test database was built from tapes and journals received from the American Chemical Society through Chemical Abstracts Service in Columbus. These tapes are reformatted into files acceptable to the typesetting system used (T_EX™). These files are then processed by T_EX along with macros that control the formatting and fonts needed for printing.

The fonts include a special graphics font for each article that is obtained by scanning the original journal at 400 dpi (dots per inch) on a Group IV facsimile machine. After journal pages are scanned, they are brought to Apollo® workstations so that the desired graphics can be cropped from the pages on the Apollo screen and stored as "character" images in a font. During the printing process, the graphics are processed simply as large characters and printed along with the text.

The typesetting process is done in two phases. The first phase includes the processing for the printed version of the original journal articles. Each article file is typeset by T_EX, printed, reviewed, and corrected during this phase. Phase two is the processing of the screen version of the original journal articles. During this phase, each article is typeset by T_EX with a format different from the printed format, previewed on screen, and corrected if needed. The screen files not only allow the user to review articles before printing, but they also allow the user to use the Graph-Text database without having a printer. This option could be very important to an individual user outside the library environment.

In a parallel process, a searchable database is built so that articles can be located and requested. This database allows full-text searching, which includes fields such as table headings and figure captions. A screen-oriented search interface and the screen files for individual articles are provided to make retrieving and reviewing articles as simple as possible.

All of this information is stored on CD-ROMs (Compact Disk-Read Only Memory discs) for distribution. Use of the system requires an IBM PC-compatible workstation with a graphics board, a CD-ROM reader, and a laser or impact printer. (IBM® ATs and Imagen® 8/300 printers are used for increased printing speed.)

Nonfiction Book Use by Public Library Users

Project Manager: Chandra Prabha, *Associate Research Scientist*
Project Staff: John Bunge and Duane Rice, *Research Assistants*

This project, which investigates how library patrons use nonfiction books, was prompted by the needs of the Electronic Information Delivery Online System (EIDOS). The objective of EIDOS, which is now under development, is to provide information to users when and where they need it. In the EIDOS scenario, a library user would access a library from his or her personal computer to consult nonfiction books for information. The user will search author or title or author/title keys, the index, the table of contents, and the title, which would be made available by the local library. By using these access points, the user will locate the specific book title and the page numbers, which presumably contain the information the user needs. The user will then retrieve the full text of these pages from a central site. The desired information will then be displayed on a computer monitor in the user's home or office.

Clearly, the EIDOS concept assumes that substantial use of books is made for obtaining or consulting information or ideas, and that, generally, nonfiction books are not read completely, but only in parts. This project tests these assumptions. In addition, it attempts to find answers, or at least partial answers, to such questions as these: Who uses the information in nonfiction books? After locating a specific book, what clues do these users employ for finding the information in that book? In what context (e.g., home or work) and how soon do patrons use the information? What is their perception of the importance of the information?

Data for this study were collected at four branch libraries and the main library of the Public Library of Columbus and Franklin County during the period February 18 to March 25, 1986. A public library was selected because it was likely to capture a wider spectrum of users than any other type of library. Nearly 350 personal interviews, considered adequate to observe any patterns in use, were conducted in the five libraries in proportion to their relative size. The hours of interviewing were randomized. Only those library users who were returning nonfiction books for themselves, 4.9% of all those who entered the library, were interviewed. (This percentage is low for a number of reasons. First, just 14.2% of library entrants were returning books. Of this group, some users were missed [interviewers were busy interviewing], some refused to participate in the study, some were not returning books for themselves, and some had no nonfiction books to return. However, of those we interviewed, 97.6% visited the library at least once a month, and 88.1% borrowed nonfiction books at least once a month.)

A typical nonfiction book user at a public library is likely to be a female (53.6%), be in the age group 25–44 years (60.8%), have at least some college education (82.1%), be employed full-time (51.6%), and have a household income in the range of $20,000 to $40,000 (42.8%).

Of the total 347 respondents, 43.8% of them claimed to be looking for specific information. Verbal responses to open-ended questions on reasons for borrowing and nature of use indicated that 55.9% of the users were looking for specific information and another 35.4% were looking for information in defined areas. These data support the EIDOS assumption that users consult nonfiction books for information.

How much of a nonfiction book do users read? Answers to this question indicate that 47.8% of the users read almost all or all of the nonfiction book, 26.8% read half or three-fourths of the book, and 25.3% read one fourth or less of the book. In other words, the assumption that nonfiction books are, generally, consulted only in parts is true of half of all use.

Not surprisingly, a majority of the users, 64.6%, were looking for information for personal use. Other users were looking for information for school (19.6%), business (16.1%), or home (13.3%). Those users who found the information they were looking for (84.4%) were asked when they intended to use the information and how important was the information to them. Of this group, 57.1% claimed that they had used the information already, and another 21.3% intended to use it within a month. An overwhelming 93.0% stated that the information was either very or somewhat important.

Of the total users, 80.8% said they had a specific use for the information; however, only 55.0% of these users stated that they were looking for specific information. It may be that the other 45.0% of the users initially did not know exactly what they were looking for but perhaps recognized it when found. One reason for this apparent discrepancy might be that finding the desired information is an interactive process—that is, a user reads some information, refines the need, reads new information, refines the need again and continues this process until the user recognizes the information as exactly what is needed or terminates this interactive process.

Clearly, nonfiction book users fall into three groups: first, those who have prior knowledge of the book they desire to borrow (24.8%); second, those who use the library catalog to decide which book to borrow (19.9%); and third, those who browse at the bookshelves to decide which book to borrow (55.3%). The last group, the bookshelf browsers, selected the particular book using the following: book title (53.1%); skimming the pages (38.5%); table of contents (24.0%); blurbs on the cover (16.1%);

author (12.5%). (These percentages add up to greater than 100.0% because multiple choices were allowed.)

Do the three groups of users referred to above use nonfiction books in substantially different ways? Do users looking for specific information use nonfiction books differently from those who are not looking for specific information? Is the nonfiction book use by the users of the main library different from nonfiction book use by the users of branch libraries? Analyses that are now in progress might provide at least partial answers to questions such as the above. This study is expected to be completed in October 1986.

OCLC CD-ROM Retrieval System Project

Project Manager: Terry Noreault, *Senior Research Scientist*
Project Staff: Mark Bendig, *Research Scientist;* Mike Oskins, *Associate Scientist;* Rob Driscoll, *Programmer/Analyst;* Keith Hocter, *Programmer;* Joan Bushek, *Research Assistant*

The OCLC CD-ROM Retrieval System project was initiated to explore the emerging technology of optical data storage. The project's primary goal is to provide OCLC members with a series of information retrieval products based on this technology. A single, five-inch optical disc (often referred to as a CD-ROM, which stands for Compact Disc-Read Only Memory) can hold up to 550 million characters, equivalent to the capacity of 1500 ordinary floppy disks. Up to 600,000 bibliographic records can be stored on one CD-ROM, providing a user with instant access to a very large database without incurring telecommunications charges or other costs associated with conventional online retrieval systems.

The primary goal of the first phase of the project was to develop a prototype reference workstation that could be demonstrated at the 1986 ALA Annual Conference in New York. The prototype consists of two main parts: the "search engine," which contains low-level subprograms providing access to the database, and the user interface, which permits the user to invoke the functions of the search engine and manipulate the results for viewing or printing.

The prototype uses the URSA search engine, which was developed for the Advanced Interface Design for Library Retrieval Systems project. It offers full Boolean search capabilities as well as several unique features, including automatic suffix removal and relevance ranking of retrieved documents. The URSA search engine provides the full range of functionality needed by the interface designer. It supports (1) Boolean operators; (2) proximity searching; (3) truncation; (4) range searching; (5) stemming; (6) ranking; and (7) record management. These features are provided to the application developer through a few simple function calls.

The prototype user interface is a visually oriented windowing system based on principles exemplified by the Apple® Macintosh™ and other advanced microcomputers. Emphasis has been placed on consistency of control and visual aesthetics to permit the user to focus on the actual job at hand rather than on the computer system itself. The user interface provides a front end that is easy to use yet still powerful enough to satisfy skilled searchers. It is menu-driven, using function keys and a windowing approach to information display. Each site is given significant flexibility in profiling the interface to their needs. In particular, the site manager may modify (1) the query grammar, (2) field names, and (3) the record display format.

This project is being conducted by the newly established Research Applications group within the Office of Research. The software developed by the project will be field tested during the summer of 1986, using subsets of the ERIC and Medline databases.

OCLC Database Use Analysis: Determination of an Appropriate Database Subset for Cataloging on the OCLC M300 Workstation

Project Manager: Brigitte L. Kenney, *Research Scientist*
Project Staff: Edward O'Neill, *Senior Research Scientist;*
John Bunge, *Research Assistant*

Optical memories are becoming available to libraries for access to full-text and bibliographic databases. Libraries use MARC records offered on optical storage devices for in-house cataloging, bibliographic verification, and similar purposes. Such applications could mean a decreased use of the OCLC Online System and the systems of other bibliographic utilities.

In accordance with OCLC's planning activities leading toward decentralization of its database, it is timely to investigate opportunities for the distribution of cataloging information for use at local workstations. The OCLC Database Use Analysis project will be a first step toward determining one or more of the characteristics of database subsets that could be placed on optical storage discs. The purpose of the project is to determine one or more appropriate subsets of the OCLC Online Union Catalog that could be distributed to library workstations for local cataloging purposes.

Sampling began on April 28, 1986. Two-hundred-fifty newly input records were randomly selected from the OCLC Online System. During that week and subsequent weeks, location symbols denoting libraries which used the record for cataloging were recorded. Four consecutive weeks were sampled in that manner, for a total of twelve weeks for the first sample, eleven weeks for the second sample, and so on.

Several selection criteria were used to create a possible subset. For example, the selected monograph had to be a current English language monograph with full MARC cataloging. Or, the record had to be recently input and had to have either an ISBN or an LCCN. In the first four samples, relatively few records were found that matched these criteria.

Two additional samples included one in which all of the records matched the above criteria and one in which all criteria were met except currentness of input date. The samples were manually analyzed to determine how many records in each sample met several criteria which had been established prior to the beginning of the study.

The rationale for criteria selection was that items matching these criteria would be used more often for cataloging by OCLC libraries than any other items in the database; thus, such items could be candidates for optical storage on a single disk.

Analysis of the data has just begun. It appears that the best predictor of use (and therefore usefulness for the optical disc subset) seems to be previous usage rather than currentness of records, presence of ISBN or LCCN, or most of the other criteria. No definite usage patterns have emerged for the currently input sample records. Additional analyses will be performed on which to base one or more recommendations for OCLC system developers.

Subject Access Project

Project Manager: Edward O'Neill, *Senior Research Scientist*
Project Staff: Diane Vizine-Goetz, *Research Scientist;*
Craig Henderson, *Research Assistant*

The Subject Access project investigated a number of problems associated with providing subject access to the full OCLC Online Union Catalog. Research had shown that derived search keys of the type used to access OCLC records by author, title, or both author and title were inappropriate for subject headings and that complete subject headings should be considered instead. Additionally, earlier studies found that errors in subject heading fields negatively affected retrieval performance despite the retrieval technique employed. The Subject Access project encompassed two major activities to address these problems: the development of indexes to support subject searching of the OCLC database using complete subject headings, and the identification and correction of common errors in subject headings.

The subject heading indexes were built from subject headings, based on Library of Congress Subject Headings, that were extracted from OCLC bibliographic records. In conjunction with the index generation, methods for correcting errors in subject heading fields were developed. Five common types of errors were found: (1) inconsistencies in capitalization, punctuation, and spacing; (2) typographical and spelling errors; (3) errors in MARC tags and subfield codes; (4) invalid forms of subdivisions; and (5) invalid forms of headings. The algorithmic identification and correction of errors in the OCLC database is an ongoing research activity.

The project also addressed the amount and types of bibliographic information to be displayed once the subject search is complete. Several levels of displays that combined information from the fixed and variable fields of MARC records were experimented with. To support this activity, classification number indexes and a file of brief bibliographic records were generated. These files were used in other related activities, including the American Fiction project (a subject analysis of the OCLC database by classification number) and the Collection Analysis project.

Publications

Martin Dillon

Microcomputer Retrieval of Survey Data. *Social Science Newsletter* 70(3): 172–75 (Fall 1985).

D: A Design Language for Retrieval System Interfaces, with Bruce Mortland and Anthony Repka. Submitted for publication.

Abstract. *This paper describes D, a language for creating interfaces to retrieval systems for library online public access catalogs. Facilities for programming in D are part of a larger system that includes a general-purpose retrieval engine for carrying out functions related to retrieval. Together they provide a means for investigating interface design issues in high-performance workstations that couple powerful microprocessors with high-resolution display screens.*

Betsy N. Kiser

Mechanisms of Electronic Publishing. In *Proceedings of the Fourth Annual IEPRC Conference.* Surrey, England: International Electronic Publishing Research Centre, Registered Office Pira House, 1985. 6-1 to 6-27.

Karen Markey

Searching and Browsing the Library Classification Schedules in an Online Catalog. In *Proceedings of the 2nd British Library-sponsored Conference on Online Catalogues,* April 1986, Bath, England. In press.

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Findings of the Dewey Decimal Classification Online Project, with Anh N. Demeyer. *International Cataloguing* 15(2): 15–19 (1986 April/June).

Dewey Decimal Classification Online Project, with Anh N. Demeyer. *International Cataloguing* 14(3): 31–34 (1985 September).

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Edward O'Neill

Class Dispersion between the Library of Congress Classification and the Dewey Decimal Classification, with Martin Dillon and Diane Vizine-Goetz. *Journal of the American Society for Information Science.* In press.

John Tolle

Effects of Variation in Menu Length and Number of Windows on User Search Time, with Michael J. Prasse and Ralph Gott. Presented at CHI'86 Conference on Human Factors in Computing Systems, Boston, April 1986. Forthcoming.

Diane Vizine-Goetz

Subject Analysis of the OCLC Database. In *Database Management: Building, Changing, and Using Databases.* Collected papers and abstracts of the 15th mid-year meeting of the American Society for Information Science. Compiled by Robert S. Baker, Raya Fidel, Terry Ann Jankowski, Jack McCormick, and Pamela A. Mofjeld. In press.

Presentations and Seminars

Martin Dillon

Automatic Synonym Recognition: An Artificial Intelligence Application

Abstract. *Fifth generation software—expert systems, knowledge systems, natural language processing systems, among others—are exciting, full of promise, and controversial. One application of such systems is automatic indexing, where the content of articles or books is represented by selecting appropriate words or phrases from them. A major obstacle to effective automatic indexing is the need to group phrases that are synonymous or nearly synonymous, a task that is beyond the power of current systems. Dr. Dillon discussed his research that employs artificial intelligence techniques to group phrases that are similar in meaning. The system he described is designed to derive clues to the meaning of phrases from the contexts in which they appear. By attempting to infer the meanings of phrases from these clues, Dr. Dillon hopes to clarify how best to represent meanings computationally and how to program computers to learn them.*

Presented at the Columbus Chapter of ASIS, December 12, 1985.

Exploring Future Technologies: EIDOS, Graph-Text, and Advanced Interface Design

Abstract. *A brief overview of the Office of Research at OCLC was presented, emphasizing its mission orientation to new products and services for OCLC members. In this context, three current projects were described as bearing on the potential contributions of new technology to the goal of delivering information to patrons. EIDOS (Electronic Information Delivery Online System) will provide online access to the full text of books through terminals located in libraries; Graph-Text is a retrieval and delivery system for formatted text and graphics that displays on a high-resolution video screen or printer a facsimile of the journal page; and Advanced Interface Design is a project that explores innovative ways to exploit high-resolution screens and powerful workstations to improve the interface between online catalogs and library patrons.*

Presented at the School of Library Science, University of North Carolina, March 21, 1986.

Brigitte Kenney

Basics of Telecommunications

In this seminar, an introduction to telecommunications was presented to librarians and other information professionals.

Presented at the Minnesota State Library, the MINITEX Network, and the South Dakota State Library in June 1986.

Betsy N. Kiser

Providing Information When and Where the User Needs It

Presented at Gutenberg II, sponsored by the American Society for Information Science, New England Chapter; Special Libraries Association, Boston Chapter; New England Online Users Group. Boston, Massachusetts, March 21, 1986

Karen Markey

Dewey Decimal Classification As a Searcher's Tool in an Online Catalog: Research Project Findings

Abstract. *The DDC Online Project demonstrated that the DDC can be a searcher's tool for subject access, browsing, and display in an online catalog. The addition of unique subject-rich terms from the DDC enhanced subject access to the online catalog. The DDC provided new strategies for subject searching and browsing that were not possible through the alphabetical approaches of subject headings and/or keywords presently supported by online catalogs. The DDC enhanced the display of subject-rich information in bibliographic records and in displays of the bookshelf areas where retrieved items in online searches were located.*

The research findings of the DDC Online Project addressed chiefly subject searchers' use of a library classification in the information retrieval environment of an online catalog. The findings provided insight into searchers' problems with online displays of the DDC Schedules and Relative Index, bibliographic record displays enhanced with subject information from the DDC, and online catalog capabilities necessary to support searching, displaying, and retrieving library catalog and classification information. As a research project studying online catalog use, the DDC Online Project furthered our general knowledge of library patron use of online catalogs, regardless of the extent to which these catalogs have been enhanced by a library classification. These research findings addressed the interests of the project participants involved in the construction and maintenance of the DDC, viz., Forest Press and the Decimal Classification Division of the Library of Congress, library administrators involved in decision making about enhancements to a library's online catalog, and library staff and technical systems staff involved in the design and implementation of an online catalog in general and, specifically, of a library classification in an online catalog.

Presented at:

Library Professional Association, UCSD, San Diego, May 1986.

UCLA's Graduate School of Library and Information Science, Los Angeles, May 1986.

Lund University library staff, Lund, Sweden, April 1986.

Royal Institute of Technology library-sponsored lecture for library staff in the Stockholm metropolitan area, Stockholm, Sweden, April 1986.

British Library, Research and Development Department and selected BL staff, London, England, April 1986.

British Library-sponsored 2nd national conference on online public access to library files, Bath, England, April 1986.

Annual meeting of the International Federation of Library Associations (IFLA), Chicago, August 1985.

RTSD-sponsored preconference on classification, Annual Meeting of the American Library Association, New York, July 1985.

Subject Searching Experiences and Needs of Online Catalog Users

Abstract. *The introduction of online catalogs in the early 1980s ushered in a host of studies examining library patrons' use of this new form of the library catalog and their needs for improving this tool. These online catalog use studies provided evidence that there is much more subject searching of online catalogs than expected, given the findings of traditional library catalog studies. Online catalog use studies revealed that users have problems with subject searching, particularly in the selection of subject vocabulary. When users fail to match their terms with the subject information in bibliographic records, they often enter terms that are broader than their topic of interest. Few users match their terms with the controlled vocabulary of the library catalog and/or bother to consult this vocabulary before or during their online search. When asked to identify desired improvements to online catalogs, users want improvements to enhance subject searching, especially lists of related terms incorporated into the online catalog.*

This presentation reviewed findings of online catalog use studies that underline the need for improvements to the subject searching capabilities of online catalogs and recommends the incorporation of subject authority records supplied by the Library of Congress into the online catalog. Such records often provide cross-references to accepted subject headings which can enhance the entry vocabulary for subject searchers. Subject authority records also feature specific and related headings ("see also" references), broader and related headings ("see also from" references), and other subject information such as suggested class numbers and scope notes for selected subject headings. This subject information can stimulate the user with regard to subject searching vocabulary. Recommendations are provided regarding the integration of subject authority records into the subject searching process and the display of subject information from these records.

Presented at:

Library Professional Association, University of Nebraska, Lincoln, Nebr., October 1986.

Florida State University-sponsored Continuing Education Workshop, Tallahassee, Fla., March 1986.

Annual conference of the Art Libraries Society/North America (ARLIS/NA), New York, February 1986.

Planning for and Implementing an Online Catalog

Abstract. *The process of planning for and implementing an online catalog consists of four major activities: (1) a needs analysis, (2) system selection, (3) system implementation, and (4) system enhancement. In this talk, each major activity is described and important tasks necessary to complete each activity are featured. This process is for libraries acquiring a packaged system from a library automation vendor. This presentation specifically addresses online catalogs; however, virtually all online catalogs acquired from a library automation vendor are but one component of an integrated library system. Other system components can be circulation, acquisitions, materials booking, serials control, and bibliographic control and maintenance. When an integrated library system offers both circulation and online catalog components, system users are able to conduct online searches and determine at the catalog whether an item of interest is available on the library shelves.*

Presented at the Annual conference of the Art Libraries Society/North America (ARLIS/NA), New York, February 1986.

Iconographical Research Collections

Abstract. *Iconographical research collections are tools which support the iconographical approach to the history of art and feature access to secondary subject matter and photographic reproductions of works of art.*

Three iconographical research collections—Index of Christian Art, Marburger Index, and the Decimal Index to Art in the Low Countries—are featured in this discussion of subject matter, methods of expressing subject matter, and indexing techniques applied to subject matter. There are four commonalities among iconographical research collections. These collections were begun by and are currently administered by art historians and scholars. They serve art historians, curators, and scholars from related disciplines. Secondary subject matter is described in these collections. The automation of records from the collections has been limited to manipulation of existing data and has introduced keyword and Boolean-based searching of existing data.

RoSA, Repository of Stolen Art, is discussed because primary subject matter of works of art is described in this database. Online searchers of RoSa—detectives, police, and other law enforcement personnel—do not have knowledge of the kind of secondary subject matter described in iconographical research collections and which is familiar to searchers of the latter collections.

This presentation concludes with present limitations and future directions of iconographical research collections.

Presented at RTSD AV Committee-sponsored program, American Library Association, New York, June 1986.

Subject Control of Library Materials (GSLIS 211)

As a Visiting Professor in spring 1986, Dr. Markey conducted this seminar for graduate library school students. The seminar focused on these topics: (1) online catalog functionality, (2) methods for studying online catalog use, (3) users' expressed needs for online catalog improvements, (4) subject authority control in online catalogs and cataloging systems, (5) online catalog interfaces, (6) planning for and implementing an integrated library system, and (7) subject enhancement of bibliographic records. Guest speakers presented talks on thesaurus construction for art and architecture, building public access databases for community information, and subject access to visual materials.

Presented at University of California, Los Angeles, Graduate School of Library and Information Science, April 1986-June 1986.

Chandra Prabha

Nonfiction Book Use by Public Library Users

Presented at Academy of Library Science and Documentation, Hyderabad, India, July 1986.

John Tolle

CONSER Abstracting and Indexing Title Overlap Project

Presented at ALA Mid-winter Conference, Chicago, January 1986.

Diane Vizine-Goetz and Edward O'Neill

Subject Analysis of the OCLC Database

Presented at ASIS Conference, Portland, Oregon, May 1986.

Programs

Visiting Scholar: A Sabbatical Research Position

The OCLC Visiting Scholar post brings experienced scientists, educators, and administrators with demonstrated research capabilities to OCLC to conduct research with OCLC staff, facilities, and data resources. The Visiting Scholars conduct research in areas of mutual interest to themselves and OCLC so that both benefit from a close working relationship.

Visiting Scholars

1985/86 **Martin Dillon,** Professor, Library Science, University of North Carolina, Chapel Hill

1985 **Terry Noreault,** Assistant Professor, Information Science, University of Pittsburgh

1984 **Allan Pratt,** Professor, Graduate Library School, College of Education, University of Arizona

1983/84 **Mary Jo Lynch,** Director, Office of Research, American Library Association, Chicago, Ill.

1982/83 **Nancy B. Olson,** Associate Professor, Audiovisual Cataloger, Mankato State University, Mankato, Minn.

1981/82 **Donald J. Sager,** Administrative Librarian, Elmhurst Public Library, Elmhurst, Ill.

1980/81 **Pauline A. Cochrane,** Professor, School of Information Studies, Syracuse University

1979/80 **William E. McGrath,** Associate Professor, School of Information and Library Studies, State University of New York at Buffalo

1978/79 **Edward T. O'Neill,** Professor of Library Science, Case Western Reserve University

Requirements

The Visiting Scholar must have a Ph.D. degree or equivalent training and substantial experience in directing and conducting research in one or more fields of interest to OCLC: e.g., library science, information/computer science, applied mathematics, statistics, psychology, and human factors.

The position is not restricted to citizens of the United States.

Nature of Appointment

The appointee is expected to conduct research that focuses on problems of significance to the library and information science community; the research need not be specific to OCLC's development and production activities. OCLC expects that research results will be published in the open literature. All publications stemming from the research conducted while at OCLC are attributed to the Visiting Scholar; acknowledgment of OCLC's support is required and coauthorship is expected where OCLC staff make significant contributions to the research effort.

Visiting Scholar's Report

Martin Dillon, as Visiting Scholar for 1985/86, helped direct the Advanced Interface Design for Library Retrieval Systems project. He also investigated automatic semantic clustering of index terms. The starting point of this project was FASIT (Fully Automatic Syntax-based Indexing of Texts), a system for automatically indexing texts that was developed under Dr. Dillon's direction at the University of North Carolina. The system uses syntactic information to identify multiword concepts and to group concepts based on overlapping keywords among phrases.

Retrieval results using FASIT have been moderately successful, but dramatic improvement seems likely only if the system can incorporate semantic information from the texts it indexes. The purpose of this investigation was to identify techniques for associating semantic information with phrases and for grouping phrases based on this information. The first stage of the project was to extend FASIT to a sufficiently large database to serve as a testbed for further experimentation. This work is nearing completion.

The second stage in the project, which is already begun, is to identify, categorize, and analyze definitional contexts—those portions of a text where a concept is being defined. Definitional contexts are usually identified as such by the use of one among a number of standard phrasings, and convey explicit information about the meaning of a concept in a form that can be extracted from a text and saved in a database for later use. The aim of this stage of the project is to automate the process of identifying such contexts and, subsequently, to automate the extraction and storage of information about the concepts being defined.

Term of Appointment

The Visiting Scholar is usually appointed for one year. Part or all of the appointee's salary and benefits may be paid by OCLC during the term of appointment.

Research Assistants

The Visiting Scholar may be assigned one or two research assistants with whom to collaborate in conducting the proposed research. The period of appointment for the research assistants will run concurrently with that of the Visiting Scholar. Research assistants must be enrolled in an accredited graduate program in an area related to the Visiting Scholar's research interests. OCLC expects that the research conducted by the research assistants during the appointment period will result in completion of their dissertations or publication in the open literature. Stipends for the appointment period will be available; travel expenses to ena-

ble research assistants to attend relevant conferences and workshops may also be provided. Selection of the research assistants is made by the Visiting Scholar in consultation with the Director of the Office of Research.

Postdoctoral Fellowship

The OCLC Postdoctoral Fellowship provides the opportunity for researchers at the start of their careers to conduct research with OCLC staff, facilities, and data resources. The Postdoctoral Fellow will normally conduct research in areas of mutual interest to OCLC and the researcher.

Qualifications

The Postdoctoral Fellow must have a Ph.D. degree or equivalent training in one or more fields of interest to OCLC, such as library science, information and computer science, applied mathematics, statistics, psychology, and human factors.

The position is not restricted to citizens of the United States.

Nature of Appointment

The Postdoctoral Fellow is expected to conduct research that focuses on problems of significance to the library and information science community. Generally, the Postdoctoral Fellow conducts research in one of OCLC's ongoing projects under the direction of a research scientist.

All publications stemming from the research conducted while at OCLC will be attributed to the Postdoctoral Fellow. Acknowledgment of OCLC's support is required, and coauthorship is expected where OCLC staff make significant contributions to the research effort.

Term of Appointment

The Postdoctoral Fellow is normally appointed for one year. Relocation assistance is available.

Previous Postdoctoral Fellows

1985/86 **Chandra Prabha,** Ph.D., Library and Information Science, University of Illinois at Urbana-Champaign, 1984. Currently, Associate Research Scientist, OCLC.

1984/85 **Padmini Das-Gupta,** Ph.D., Information Transfer, Syracuse University, 1985. Currently, Assistant Professor, Computer Information Science Department, George Mason University.

1983/84 **Diane Vizine-Goetz,** Ph.D., Library and Information Science, Case Western Reserve University, 1983. Currently, Research Scientist, OCLC.

Research Assistants

The OCLC research assistant position enables full-time university students to participate in research at OCLC in Dublin, Ohio, while pursuing an academic degree. Program participants may pursue independent research using OCLC facilities during nonwork hours to complete academic requirements.

Research Assistant Activities

- Assist in the design, implementation, and execution of research at OCLC
- Support full-time research activities, such as literature searching, data collection and analysis, and computer programming
- Assist in the preparation of research proposals, reports, and publications

Qualifications

Candidates must be enrolled full time in an accredited university program. Program areas may include (but are not limited to):

- Library science
- Computer science
- Information science
- Industrial engineering
- Systems engineering
- Communications
- Psychology
- Marketing
- Linguistics

Terms of Appointment

OCLC provides research assistants a monthly stipend and pays tuition fees for each academic term the position is held. Fringe benefits are not included, and the stipend is subject to federal, state, and local taxes. Working hours are flexible.

Renewal

Renewal of the position depends upon both academic and OCLC performance. Reappointment to succeeding academic terms is considered prior to the end of a current term.

Additional Program Information

Environment, Travel, and Applications Information

Environment

Resources available to the Visiting Scholar, the Postdoctoral Fellow, and research assistants include access to usage statistics and various other data that relate to OCLC's database and communications network. Hardware (XEROX® Sigma 9, Apollo, Tandem™, SUN, VAX™, MicroVAX™, Pyramid Technology™, and IBM computers) and software (including utility routines) apart from the OCLC operations computer system are available for research purposes. OCLC staff are available for consultation. Secretarial, editorial, and graphics support are also provided.

Travel

Relevant travel and business expenses connected with the Visiting Scholar or Postdoctoral Fellowship appointment and the research assistant position are reimbursed by OCLC, when approved by the director of the Office of Research.

Applications

Candidates for the Visiting Scholar or Postdoctoral Fellowship appointment should submit a letter of interest, including a current vita, date of availability, and specific research interests, to the Director, Office of Research, OCLC Online Computer Library Center, Inc., 6565 Frantz Road, Dublin, OH 43017-0702. The application deadline is February 1. Candidates are selected by April 1 for appointment in either July or September. Candidates for research assistantships should submit, either directly or through their advisors, a letter of interest, a current vita, and the date of availability to the Human Resources Department, OCLC, 6565 Frantz Road, Dublin, OH 43017-0702. Applications are accepted at any time.

Distinguished Seminar Series

Periodically, the Office of Research invites lecturers to visit OCLC and to formally share their expertise in areas of mutual interest. Thus, OCLC staff have the opportunity to learn from and interact with leaders in the fields of library and information science. This year's speakers were M. Lynn Neufeld, former executive director of the National Federation of Abstracting and Information Services; Gerard Salton, professor, Cornell University, and Joel Fagan, graduate student, Cornell University; Wesley L. Boomgaarden, preservation officer, The Ohio State University Libraries; Joseph W. Price, chief of the Science and Technology Division, Library of Congress; Charles M. Dollars, assistant director of Archival Research and Evaluation at the National Archives and Records Service; Michael Gorman, director of General Services, University of Illinois at Urbana-Champaign Library; and F. W. Lancaster, professor, Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign.

1985–86 Seminars

Databases: Dinosaurs to Compact Discs

by

M. Lynn Neufeld

October 8, 1985

Ms. Neufeld discussed how in the last twenty years the database/online industry has become a large and thriving segment of the information industry. She summarized the growth of databases, major milestones, issues, and trends of these twenty years.

Ms. Neufeld currently is a consultant in the area of planning and development for information services. Until September 1985, Ms. Neufeld was executive director of the National Federation of Abstracting and Information Services (NFAIS). Ms. Neufeld received her B.Sc. degree in chemistry from the University of Alberta, Canada, and her M.S. degree in information science from Drexel University. She is the author of over 20 publications and presentations and is active in the American Society for Information Science, having served as a member of the awards, education, and marketing committees for the national organization. She serves on the Executive Councils for the ANSC Z39 and ASIDIC.

The Generation of Complex Content Descriptions for Document Identification

by

Gerard Salton and Joel Fagan

November 11, 1985

Dr. Salton and Mr. Fagan presented the results of their research project on complex identifiers, such as noun groupings, which are widely used for document identification in many practical environments. Noun phrases are used, for example, in back-of-the-book indexes and as subject indicators on catalog cards. They discussed past efforts dealing with the automatic generation of complex subject descriptions and described recent work in the area of syntactic phrase generation.

Dr. Salton is a professor of Computer Science at Cornell University in the area of automatic information retrieval. Dr. Salton received his B.A. and M.A. degrees in mathematics from Brooklyn College and his Ph.D. degree in applied mathematics from Harvard University. He has served as editor for a number of journals, including *ACM Computing Surveys* and *ACM Transactions on Database Systems.* Dr. Salton received the ASIS award for best information science paper in 1970 and again in 1975. His publications include *Dynamic Information and Library Processing* and *Introduction to Modern Information Retrieval.*

Mr. Fagan is a graduate student in linguistics and computer science at Cornell.

Preservation Administration in Research Libraries: Making the Past Accessible to the Future

by

Wesley L. Boomgaarden

January 7, 1986

Mr. Boomgaarden discussed how preservation administration is developing as a new subfield of librarianship. He outlined the practicalities and potential of existing technologies that are needed to save those that have failed. Mr. Boomgaarden stressed the importance of the bibliographic utilities in preservation administration, especially in the bibliographic control and access to preservation microform masters and to preservation copies of important research materials in original format.

Preservation became a recognized subfield only after the Columbia School of Library Science instituted its preservation and conservation programs in 1981. Mr. Boomgaarden said the study of preservation administration includes aspects of building design, including heating, ventilation, air conditioning, relative humidity, and plumbing.

Optimum environment differs considerably for microfilm, books, and human beings according to Mr. Boomgaarden. Most libraries (especially the post-World War II buildings) are people-friendly and book-hostile. Unregulated humidity, temperature, light, and pollution are the major deterrents to proper storage. Usually, library temperatures are kept nearer to 72 degrees than 62 degrees. But a book stored at the higher temperature will last only half as long.

Mr. Boomgaarden believes that bibliographic networks can play an important role in preservation by identifying which materials need to be preserved. Also, ways must be found to provide a full menu of treatment services and options for collections. Options might include reprographic treatments such as preservation microfilming or preservation xerography using alkaline paper; routine, nondamaging repair techniques; a system of providing protective enclosures in a phased preservation program; appropriate commercial binding and rebinding; conservation laboratory treatment; replacement by commercially available microfilm and paper-copy reprints; and deaccessioning.

Mr. Boomgaarden said information compaction will play a more prominent role in the future. In addition to major microfilm preservation projects, optical disc technology is increasingly a medium of choice for current research and information storage/retrieval, especially in the sciences.

For the retention of important materials in original format, the most exciting new technology is the Diethyl Zinc (DEZ) process developed at the Library of Congress and the Wei T'o process of the Public Archives of Canada. Both institutions have mass deacidification facilities. In a typical week, 15,000 books are expected to be stabilized when the Library of Congress opens its $11 million DEZ facility at Fort Detrick, Maryland, in early 1988. Deciding which of the Library's 80 million volumes will enter the deacidification chamber first will be precedent-setting, Mr. Boomgaarden said. However, the qualifications used will probably set guidelines for institutions nationwide.

Mr. Boomgaarden received his M.A. in library science from the University of Minnesota. He has earned a Certificate of Advanced Librarianship in preservation administration from the School of Library Science, Columbia University. Since 1981, he has been working in the area of preservation in various libraries. In 1984, he joined The Ohio State University Libraries as a preservation officer. He is responsible for designing and implementing a comprehensive preservation and conservation program.

Optical Disk Technology and Library Needs

by

Joseph W. Price

February 18, 1986

The Library of Congress recently launched the Optical Disk Pilot Program to explore the feasibility of using optical disk technology for solving the problems of preservation of library services. According to Project Director Joseph W. Price, the program utilizes conventional video disk technology for collections where color and motion are vital, and uses the more innovative digital disk technology for storing and displaying maps, microfiche, printed sheet music, legal materials, manuscripts, and journals. The program hopes to measure researcher acceptance of electronic displays as substitutes for the original materials, which are either disintegrating from the acid in their paper or are too fragile, cumbersome, or rare to be handled. Additionally, electronic and physical testing of the disks will be performed to evaluate their utility as a stable preservation medium. The Library has an advisory committee for this project consisting of prominent librarians and publishers who are helping the Library deal with the inevitable questions of intellectual property ownership, copyright, and royalty.

Optical disk storage involves the high-density recording of information using lasers and wavelengths of light. Because the disks are read by reflective light, there is no wear or image degradation from prolonged use. Mr. Price estimates that of LC's eighty million items, fifty-seven million are special collections (thirty million of those are manuscripts). A majority are so frail or rare that they have been totally deaccessioned. By reducing handling, years of life are added to the materials. The most common applications of this new technology are the optical digital data disk and video disk, each with an optimum storage capacity of 10,000 to 15,000 pages of text per twelve-inch disk side. The storage densities possible in optical disk storage make archiving more manageable.

The Library divided the Optical Disk Pilot Program into print and nonprint projects. The print project uses digital technology and custom-designed equipment, while the nonprint project uses analog technology and "off-the-shelf" equipment.

Mr. Price said he believes a balance must be struck between the public's right to reasonable access to published materials and the need to protect the economic basis for publishing to guarantee its continuance. Xerography has affected this balance in the past, he said, and in the future optical disk technology is most likely to be of consequence to publishing in both the public and private sectors. The Library of Congress Optical Disk Advisory Committee, made up of a group of distinguished librarians and publishing executives, is providing guidance to LC in this area.

Joseph W. Price was appointed to the position of chief of the Science and Technology Division, Library of Congress, in October of 1981. In February 1983, he was assigned the additional responsibility of directing the Library's efforts in exploring the use of new optical disk technologies.

A native of Meridian, Mississippi, Mr. Price received his B.A. degree with honors from Sam Houston State University in 1966 and his M.L.S. degree from the University of Texas in 1967. Pursuing further graduate studies at American University, he received his second M.S. degree in technology of management in 1976 and an advanced graduate certificate in operations research in 1979.

Active in many professional organizations, Mr. Price has represented the Library of Congress on several committees or task forces convened by the American Library Association, the National Commission on Libraries and Information Science, the Council on Library Resources, the International Federation of Library Associations (IFLA), the International Serials Data System, and UNESCO. He currently represents the Library of Congress on an ad hoc committee of the U.S. Congress' Joint Committee on Printing, which is examining the issue of government document depository library access to federal databases. Mr. Price chairs both the IFLA Division of Special Libraries and the IFLA Section on Science and Technology Libraries and serves on the IFLA Professional Board.

Electronic Information Handling Technologies: Preservation Issues

by

Charles M. Dollars

March 11, 1986

Dr. Dollars reviewed new developments in magnetic media, including perpendicular recording, optical recording, hardware developments (most notably parallel processing), and data conversion. Preservation issues that relate to recording technology, media, access, and technology obsolescence were discussed. Dollars addressed research activity issues in some detail. These research activities are supported by such agencies as the U.S. National Bureau of Standards, the National Archives of the United States, and the Department of Telecommunications in the United Kingdom.

Dr. Dollars presented two aspects of preservation: preventive issues and anticipatory issues. The former included adherence to certain guidelines for the care and handling of magnetic media and optical digital data media, and the latter addressed such matters as low-risk technologies and the use of standards.

Dr. Dollars has been with the National Archives and Records Service (NARS) since 1974. At NARS he has been a director of many divisions: Machine Readable Archives, Technology Assessment, FBI Appraisal Task Force, and Special Archives. He is now the assistant director of Archival Research & Evaluation. Before joining NARS, he taught in the Department of History at Oklahoma State University. Dr. Dollars received his M.A. and Ph.D. from the University of Kentucky. He has been writing widely in the fields of history and preservation.

Cataloging for the Electronic Union Catalog

by

Michael Gorman

April 1, 1986

The maturing of library automation has made bibliographic control much more meaningful. In particular, the ability to make records available in a timely manner throughout the country and to all kinds and sizes of libraries has created a greatly increased interest in the mechanisms of bibliographic control. Such topics as the content of the machine-readable record and the matching of bibliographic records are of practical as well as theoretical importance. In his lecture, Mr. Gorman discussed the nature and content (descriptive data and name and subject access points) of the MARC record. He contrasted "unique record" and "multi-record" databases and outlined strategies for matching records to records and records to materials.

According to Mr. Gorman, the technological sophistication of the electronic library will have little impact on future generations unless traditional cataloging methods are substantially revised. He identified as areas to be standardized authorities (for subjects, titles, and series), bibliographic description (for unambiguous identification), and the format (used to hold, manipulate, and retrieve data). Mr. Gorman recommends a cataloging code that would explain how to construct an authority record, link that record to bibliographic descriptions, and explain how to construct bibliographic descriptions (within which would be data that would form an invariable core for use in machine-readable databases).

Mr. Gorman believes that classification numbers only confuse the purposes of classification. He advocates libraries using two classification schemes: a shorter number to shelve and retrieve materials, and a longer (as complex as needed) number for online catalog manipulation. Furthermore, he believes that MARC records and MARC databases inhibit change of any kind. They hamper the revision of cataloging practices and are inhospitable to new materials. To him, the MARC record is a complex record that has no connection with any other record. What is needed are simple records with complex connections.

Mr. Gorman favors the single-record database—a system of "universal bibliographic control"—in an electronic national union catalog that would minimize cataloging effort. According to him, universal bibliographic control essentially revolves around the idea that each thing should only be cataloged once and everyone else should use that record. For example, if an item were cataloged at the University of Illinois at Champaign-Urbana, then it would not be cataloged anywhere else—not even at the Library of Congress.

Mr. Gorman received his professional education in the United Kingdom. He joined the British National Bibliography as a research assistant; he later became the Head of Cataloging. He has served as a bibliographic consultant for the British Library Planning Secretariat. Since 1977, Mr. Gorman has been with the University of Illinois at Urbana-Champaign Library, first as the director of Technical Services, and now as the director of General Services.

Mr. Gorman is a prolific writer. In addition to many book reviews, he has to his credit seven books, chapters in thirteen books, and more than forty papers. He is coeditor of *Anglo-American Cataloguing Rules*, Second Edition. For *American Libraries* (1978–82), Mr. Gorman wrote a regular column, "Towards Bibliographic Control." He has conducted several workshops on cataloging. His honors include the Margaret Mann Citation for 1979 in cataloging and classification.

The Use of Machine Readable Databases in Technological and Social Forecasting

by

F. W. Lancaster

May 6, 1986

The databases that are readily accessible through online networks have potential uses beyond that of bibliographic searching. Professor Lancaster discussed the possibility of using these databases to plot the growth of the literature on some topic and its movement from one context to another. The technique has possible utility in identifying issues likely to have technological or social impact at some future date.

According to Dr. Lancaster, most new ideas first appear in publications with a limited focus and audience, such as a science or technical journal. Once an idea moves from a specialized area into that of popular literature, it is likely the idea will be brought to the attention of legislators. With the passage of some form of legislation, the idea will have attained the culmination of issue status.

Dr. Lancaster said he believes that, in the future, tracking will be used not only in issues management but as a part of historical research. Currently, only limited historical research is possible because database indexes go back only 15 years and utilize only single-word references. As databases become more comprehensive and indexing techniques become more sophisticated, tracking will be a very practical tool in plotting historical development of issues and ideas.

Dr. Lancaster said he would like to see some kind of tracking device that would alert researchers to a significant new term in the database. Additionally, he advocates a system that could actually count the incidence of new terms over a given period and track their movements from one specified database to another.

Dr. Lancaster has been teaching at the Graduate School of Library and Information Science in the University of Illinois at Urbana-Champaign since 1970. Of his earlier appointments, two merit a special mention. Dr. Lancaster participated in the now classic Cranfield (UK) Experiments in Information Storage and Retrieval. At the National Library of Medicine, he evaluated the MEDLARS Demand Search Service.

In addition to numerous reports and articles, Dr. Lancaster has published six books. Three of these, the *Information Retrieval Systems: Characteristics, Testing and Evaluation*, the *Information Retrieval Online*, and *Toward Paperless Information Systems* received the ASIS Best Information Science Book Award in the years 1970, 1974, and 1979 respectively. In 1978, Dr. Lancaster received the ALA Ralph Shaw Award for the outstanding contribution to the literature of library science for his *Measurement and Evaluation of Library Services*. He is the first recipient of the Outstanding Information Science Teacher Award (1980).

External Research Activities

The OCLC Offices of Research and Technical Planning occasionally collaborate with, support, or fund the endeavors of other institutions pursuing information and library science-related projects of interest and importance to OCLC, its membership, or librarianship in general.

Collaborative Programs

The collaborative programs in which research staff were engaged during 1985–86 are the Applied Information Technologies Research Center and the American Fiction Project.

American Fiction Project

Project Participants

OSUL: Geoffrey D. Smith, *Curator of William Charvat Collection of American Fiction;* Robert A. Tibbetts, *Curator of Special Collections;* William J. Crowe, *Assistant Director for Technical Services*

OCLC: Edward T. O'Neill, *Senior Research Scientist;* Diane Vizine-Goetz, *Research Scientist*

The American Fiction project of The Ohio State University Libraries (OSUL) was the focus of a cooperative research effort between OSUL and the OCLC Office of Research. The purpose of the American Fiction project, which is an ongoing project at OSUL, is to improve access to OSUL's early 20th century American fiction collection and to identify and acquire new titles for the collection. For its part, OCLC identified catalog records in the OCLC Online Union Catalog for items suspected to be within the project's scope. Results of OCLC's database search for potential American fiction records were analyzed by the Division of Special Collections of OSUL. Both OSUL and OCLC found the cooperative effort useful. The American Fiction project used OCLC's search results to enrich and refine the project's bibliographic file. Many titles of American Fiction that have been overlooked in previous scholarly research will become part of the canon of American literary and cultural history. OCLC was able to compare its bibliographic database against an established bibliographic file. The results and analysis suggest that the methodology employed can be of great assistance to bibliographic scholars.

Applied Information Technologies Research Center

OCLC is a member of the Applied Information Technologies Research Center (AITRC), a not-for-profit consortium of scientific, educational, and business organizations dedicated to research and development in the area of computer-based information systems and products. OCLC is one of eight technology applications centers designated by the State of Ohio. The other members are Battelle Columbus Laboratories, Carnegie-Mellon University, Chemical Abstracts, CompuServe, Mead Data Control, The Ohio State University, and Wright State University.

AITRC members collaborate on a wide spectrum of applied research pertaining to online information technology. The AITRC board of trustees has identified three areas for immediate development:

Personal identification technologies. Research and development is now underway to develop secure access to private and subscription databases. Personal identification plays a critical role in the electronic transfer of computer-based products and services that require an appropriate level of security and protection. AITRC will pay particular attention to identifying and qualifying remote users.

Intelligent user interfaces. Intelligent user interfaces, including natural languages, will permit users to access online databases and computer systems more easily and conveniently in their own language, rather than through complex command languages or menu searches. New and enhanced interfaces will benefit information users in all areas of science, education, and industry, as well as accelerate public acceptance of computer-based information retrieval.

Expert systems. Based on research in artificial intelligence, expert systems will solve complex problems by emulating the knowledge-based reasoning of human experts. These "smarter" information systems will enable less experienced people to interact with machines more effectively, ultimately leading to the far more powerful information systems anticipated during the next two decades.

OCLC/Office of Research Funded Programs

Programs or institutions that have received funding from the OCLC Office of Research for fiscal year 1985–86 are the OCLC Library School Research Equipment Support Program, the MIT Media Laboratory, and the VOCAT project.

OCLC Library School Research Equipment Support Program

Project Manager: Mary Taylor, *Research Information Specialist*

The OCLC Library School Research Equipment Support (LSRES) Program is designed to assist schools of library and information science conduct technical research by providing researchers with OCLC M300™ Workstations. The program provides for all delivery, installation, and peripheral charges, plus selected Online System charges and modem charges for the duration of the research project.

To participate, eligible institutions (schools of library and information science) are required to submit a technical proposal that (1) describes the nature, scope, and method of the proposed project; (2) explains why the research is innovative; (3) explains how the M300 Workstation is important to the research; (4) identifies methods that will be used to measure the success of the project; and (5) suggests future research that might build on anticipated results of the project. OCLC does not place any restrictions on collaborative projects.

Proposals meeting the above requirements are given to OCLC staff members who conduct an initial review. Selected proposals are then distributed to a panel, which evaluates, ranks, and recommends the proposals to the Vice President of Research and Technical Planning, who makes the final funding decisions.

When a grant is awarded, a research project monitor from the Offices of Research and Technical Planning is appointed to assist the grant recipient with the installation of equipment and to serve as an OCLC resource person to the project.

Most LSRES Program-supported projects are expected to be conducted within one year of equipment installation, although longer projects are possible. Successful applicants supply OCLC with a final project report at the end of the project period. The results of all research are expected to be in the public domain. Upon successful completion of a project, OCLC automatically transfers the title to the equipment to the grant recipient.

1986 Grant Recipients

OCLC received 31 grant proposals by the March 31, 1986, deadline. The proposals were initially reviewed by staff members of the OCLC Offices of Research and Technical Planning and subsequently ranked by a panel representing various perspectives.

The panel members were Johanna Bowen, Serials Librarian, SUNY at Cortland; Martin Dillon, OCLC Visiting Scholar from the School of Library Science, The University of North Carolina at Chapel Hill; Mary Ellen Jacob, OCLC Vice President, Library Planning; and Linda May, Manager, Marketing and Library Relations, NELINET. The panel gave its recommendations to Michael McGill, OCLC Vice President of Research and Technical Planning.

Six grants were awarded for the 1986 OCLC/LSRES Program:

Grants Awarded

Proposal Title	Principal Investigator
Variations in Subject Cataloging on Non-LC Cataloging Records in the OCLC Database	Lois Mai Chan, Professor University of Kentucky
Assessing Access to Alternative Press Publication: Women's Press Titles in the OCLC Database	Suzanne Hildenbrand Assistant Professor State University of New York at Buffalo
Tables of Contents in OPACs	Mark T. Kinnucan Assistant Professor University of Western Ontario
Dynamics of the OCLC Online Union Catalog	Debora Shaw Assistant Professor University of Illinois at Urbana-Champaign
Studies in Automatic Cataloging	Elaine Svenonius, Professor University of California
Holdings as a Measure of Journal Value	Danny P. Wallace Assistant Professor Louisiana State University

Letters to the principal investigators notifying them of the status of their proposals were mailed during June. Press releases were written and distributed both at the beginning of the project in January and in June after the selections were made.

The quality of the proposals received this year was high, and the potential for quality research is very exciting. The application filing deadline for the 1987 OCLC/LSRES Program is March 31, 1987. A program announcement will be distributed in early fall 1986.

MIT Media Laboratory

The OCLC Office of Research partially funds the newly created MIT Media Laboratory, a unique interdisciplinary laboratory directed by Nicholas Negroponte and Jerome Wiesner (former president of MIT). The Media Laboratory supports advanced study and research in the area of new information technologies.

The Media Laboratory is composed of these eleven groups that were previously parts of schools or departments at MIT: electronic publishing, learning research, advanced television, computer music, spatial imaging, graphics, human-machine interface, telecommunications, film and video, computer graphics and animation, and computers and entertainment.

At the laboratory, emphasis is placed on the invention of new means of communication and their innovative use. Educational technologies are developed in concert with leading research in epistemology and child development. Digital signal processing is studied in the context of music theory and advanced television technologies. Computer graphics and animation systems draw on work in design automation, robotics, and interactive entertainment. Research on the human-computer interface is focused by the requirements of affiliated projects, ap-

plications of which range from the home to the aerospace industry. In short, the Media Laboratory at the Massachusetts Institute of Technology is where science and application of communications media meet.

VOCAT Project

The Office of Research also provides funding support to the VOCAT (Vocabularies of Criticism and Theory) project, the purpose of which is to make available to students and scholars an encyclopedic dictionary that explains on historical principles the terminology of twentieth-century critics and theorists. VOCAT is intended to provide a systematic survey of usage for critics, theorists, advanced students, and scholars in other disciplines who use literary terms. It is also intended as a research tool to take its place among standard reference works in all the major libraries here and abroad.

The Editor-in-Chief of the dictionary is Ralph Cohen, the William R. Nevan, Jr., professor of English at the University of Virginia. Professor Cohen is one of the most widely esteemed scholars in humanistic studies. His journal, *New Literary History* (published by Johns Hopkins), is internationally recognized as the most coherent, carefully constructed, and accurate periodical on literary theory. The editorial staff is composed of Miami University faculty.

VOCAT will produce at Miami University a large database of definitions, historical essays, correspondence, and other reference materials—a major research base for the humanistic disciplines. The database will be the source of several interim publications—articles, issues of journals, and smaller volumes of definitions or other historical materials. Regular scholarly meetings will be focused on the implications of this information, especially the new research directions it suggests.

The project will culminate in a printed encyclopedic dictionary of about 1,000 double-column pages. The dictionary will also be available on CD-ROM.

OCLC hopes to benefit from the project by (1) gaining experience about data processing-related problems associated with the creation of such a dictionary and (2) using the resulting files for experimental retrieval studies.

Office of Technical Planning

Director's Statement

The 1985–86 year has been one of significant growth for the Office of Technical Planning. The staff grew from one employee to three full-time and one part-time employees. In the best OCLC tradition, we moved twice during the year, but we are now settled in an area that should accommodate our needs for some time and facilitate the sharing of resources with the Office of Research and the Research Applications group.

During the past fiscal year, our CD-ROM activities were successfully transferred to other OCLC groups that have, in turn, moved several CD-based products into field test. Our optical storage work continues, but the focus has shifted to write-once and erasable devices and integrated mass storage subsystems that will support the rapidly growing storage needs projected for the next decade. During the year, we produced a videotape that reviewed our optical disc efforts. Other technology assessment activity continued during the year, and we look forward to stepping up our activities in voice recognition technologies, intelligent scanning devices, and high-resolution displays.

Our standards activities continued in the area of machine-to-machine protocols for library applications. In addition, we have been active in the development of standards for CD-ROM file formats, extending our efforts to include work with European and international standards bodies. Our work with the OSI (Open Systems Interconnection) protocol standards has become increasingly important as OCLC has moved to support the Linked Systems Project protocols and as planning for the new OCLC Online System accelerates.

While the past year has been a challenge to Technical Planning staff, the rate of technological change has not slowed, and the importance of understanding the implications of this change for OCLC and the libraries we serve is undiminished. We look forward to the challenges of the next year and to the opportunity to help shape our future.

Howard Turtle
Director
Office of Technical Planning

Program Descriptions

Technology Assessment

The technology assessment program is aimed at identifying new technologies of potential interest to OCLC and evaluating specific technologies where appropriate. Technology assessment activities are conducted throughout OCLC, drawing on specialized library, technical, and marketing expertise. Much of this activity is coordinated within the Office of Technical Planning to reduce duplication of effort, to ensure consistently high-quality evaluation, and to provide wider distribution of results.

The principal function of technology assessment staff within Technical Planning is the hands-on evaluation of hardware, software, and telecommunications technologies for possible use in OCLC products and services. Ongoing or recently completed evaluations include: CD-ROM, write-once, and erasable optical disc drives and media, voice systems, voice recognition, OCR scanning devices, distributed mass storage subsystems, and new processor architectures.

As a by-product of technology assessment activities, a series of Technology Assessment Reports reviewing technologies of tactical or strategic importance to OCLC and to libraries are prepared on a quarterly basis. These reports generally include a detailed review aimed at a technical audience and an analysis of the current and potential applications of the technology and its competitive implications aimed at a more general audience. Recently completed titles include "Distribution of the OCLC System: Background and Issues," "Open System Interconnection (OSI) Model," "Optical Character Recognition (OCR) Technology," and "Optical Discs."

Technical Standards

The Office of Technical Planning is actively involved in the development of national and international standards. Technical Planning staff currently represent OCLC on the following standards committees:

NISO Subcommittee D—Computer-to-Computer Protocols
NISO Subcommittee EE—CD-ROM File Structures
ECMA Technical Committee 15—Labeling and File Structures

In addition, Technical Planning monitors standards work related to the Open System Interconnection (OSI) reference model through X3, ISO, and ECMA.

Internal Consulting

As a result of specialized expertise acquired through technology assessment and standards activities, Technical Planning staff are frequently called upon to answer technical questions, to provide technical background information for senior management, and to provide consulting support for OCLC projects and long-term planning activities. Internal consulting is conducted as needed and as staff time permits.

Publications/Presentations

Publications

Howard Turtle

The Open Systems Interconnection (OSI) Reference Model. In *Telecommunications Networks: Issues and Trends.* Edited by M. E. L. Jacob. White Plains, NY: Knowledge Industry Publications, Inc., 1986. 41–65.

Document Retrieval and Printing Using CD-ROMs, with Thomas Hickey. In *PROTEXT II: Proceedings of the Second International Conference on Text Processing Systems.* Edited by J. J. J. Miller. Dublin, Ireland: Boole Press, 1985. 192–97.

The Telephone System. Chapter 5 in *Telecommunication for Managers.* Edited by Charles E. Meadow and Alan Tedesco. McGraw Hill, 1985. 91–123.

Presentations

Howard Turtle

CD-ROM Overview

Presented to network directors at OCLC.

Optical Disk Technologies at OCLC (videotape with OCLC staff members Mark Crook, Thomas Hickey, Mary Marshall, Terry Noreault, and Mike Oskins, February 1986)

Mike Oskins

Optical Storage Technologies

Presented at the Houston Area Research Libraries Consortium, May 1986.

Staff Biographies

Staff Biographies

Mark W. Basham
Programmer III
EIDOS Project

B.S., Computer and Information Science, The Ohio State University

Mr. Basham designs software for the translation and loading of books for the Electronic Information Delivery Online System (EIDOS) project.

Prior to joining OCLC, Mr. Basham was a consultant with the Instruction and Research Computer Center of The Ohio State University.

Mark W. Bendig
Microcomputer Specialist
Research Applications

B.S., Electronics Engineering, The Ohio State University

Mr. Bendig is currently assigned to the newly established Research Applications group, which develops information retrieval systems utilizing optical (CD-ROM) data storage. He is responsible for user interface design.

Since joining the Office of Research in 1980, Mr. Bendig has participated in a variety of projects, with emphasis on user equipment and user interface design. Mr. Bendig created the original OCLC Interlibrary Loan Micro Enhancer microcomputer program and designed and programmed a computer-based training (CBT) authoring system, which OCLC has used to create tutorials and product demonstrations.

Prior to joining the Office of Research, Mr. Bendig worked in OCLC's Engineering Department. He has also worked for Motorola, Inc., as a technical editor, and for General American Research Division (GARD) as an electronics engineer.

John A. Bunge
Research Assistant
Office of Research

B.A., Music/Philosophy, Macalester College; M.A., French, Miami University; M.S., Statistics, The Ohio State University

Mr. Bunge serves as statistical consultant to the Nonfiction Book Use by Public Library Users project and to the OCLC CD-ROM Retrieval System project.

He is pursuing a Ph.D. degree in mathematical statistics at The Ohio State University.

Joan Bushek
Research Assistant
Research Applications

B.F.A., Ohio University

Ms. Bushek is writing technical documentation and assisting in software development for the OCLC CD-ROM Retrieval System project.

Before joining OCLC, Ms. Bushek was employed by the Ohio Department of Natural Resources. She is currently working on an M.S. degree in computer and information science at The Ohio State University.

Barbara Clapp
Secretary
Office of Research

Ms. Clapp is a secretary in the Office of Research, where she provides support to research scientists, research assistants, programmer/analysts, and the members of the Research Applications group. Prior to joining OCLC, Ms. Clapp worked as an administrative assistant at Solar Energy Research Institute, Golden, Colorado, for two years and at the Sutphen Corporation, Amlin, Ohio, for nine years.

Martin Dillon
Director
Office of Research

B.S., English, Canisius College; Ph.D., English, State University of New York at Buffalo

In addition to Dr. Dillon's responsibilities as director of the Office of Research, he is also the project manager for both the Advanced Interface Design for Library Retrieval Systems project and the Automatic Semantic Clustering of Index Terms project.

Dr. Dillon was both an assistant and an associate professor of Library Science at The University of North Carolina. He designed and directed the development of numerous automated systems, particularly in the areas of library applications and information retrieval.

Robert P. Driscoll
Senior Programmer/Analyst
Research Applications

B.S., Computer and Information Science, The Ohio State University

Mr. Driscoll is currently in charge of developing, enhancing, and maintaining the search engine for the OCLC CD-ROM Retrieval System project. He is also systems administrator for the SUN-3 network in the Office of Research.

Before joining OCLC in December 1984, Mr. Driscoll was employed by The Ohio State University Hospitals.

Judith A. Franklin
Administrative Coordinator
Office of Technical Planning

Ms. Franklin is the administrative coordinator for the director of the Office of Technical Planning.

Before transferring to the Office of Technical Planning, Ms. Franklin was a secretary in the Office of Research.

Prior to joining OCLC in 1984, Ms. Franklin was office manager for the Columbus regional office of Measurex Systems, Inc., and office manager for an ophthalmologist in the College of Medicine at The Ohio State University.

Jeffrey L. Gerckens
Research Assistant
Office of Research

B.S., Computer and Information Science, The Ohio State University

Mr. Gerckens is developing display and font manipulation software for the Graph-Text project. He has developed software and prepared databases for the Dewey Decimal Online Classification project.

Ralph E. Gott
Research Assistant
Office of Research

B.S., Psychology, University of Massachusetts/Amherst; M.A., Experimental Psychology, The Ohio State University

Mr. Gott is currently working on the Display Formats project. While at OCLC, he has worked on the Transaction Analysis project and the Dewey Decimal Classification On-line project.

Prior to joining OCLC, Mr. Gott was employed as a statistical programmer by The Ohio State University graduate school and as a research associate in experimental psychology at OSU. He is pursuing a Ph.D. degree in quantitative psychology at The Ohio State University.

Sehchang Hah
Research Assistant
Office of Research

B.A., Psychology, Seoul National University; M.A., Human Factors Psychology, The Ohio State University

Mr. Hah is currently conducting experiments on enhancing terminal text displays. He has worked on analysis of online search behavior, interlibrary loan analysis, and the Graph-Text electronic document delivery project.

Before joining OCLC, Mr. Hah worked as a research associate in human factors psychology at The Ohio State University. He is pursuing a Ph.D. degree in human factors psychology at OSU.

W. Richard Hale
Programmer/Analyst
Office of Research

B.B.A., Business Administration, Marshall University; M.S.S.M., System Management, University of Southern California; M.S.C.S., Computer Science, West Virginia University

Mr. Hale is developing software for the Electronic Document Delivery project.

Prior to joining OCLC, Mr. Hale was a U.S. Army officer with assignments in infantry, special forces, and logistics.

John C. Handley
Programmer/Analyst
Office of Research

B.S., M.S., Mathematics, The Ohio State University

Mr. Handley investigates typesetting language translation and printing system software for the Electronic Document Delivery project.

Before joining the Office of Research, Mr. Handley was an operations research analyst (cooperative student work program) at the Federal Aviation Administration Technical Center.

Cindy Heffelfinger
Administrative Coordinator
Office of Research and Research Applications

Ms. Heffelfinger is the administrative coordinator for the director of the Office of Research.

Ms. Heffelfinger has worked in the Office of Research since June 1982. Prior to joining the Office of Research, she worked in the Marketing and User Services Division for a year.

Before coming to OCLC in December 1980, Ms. Heffelfinger worked at Chemical Abstracts Service.

Craig Henderson
Research Assistant
Office of Research

Mr. Henderson is developing programs for the Pilot Subject Access System and the Automated Title Page Cataloging projects.

Before joining OCLC, Mr. Henderson worked as a consultant, primarily for Riverside Methodist Hospital.

Mr. Henderson is pursuing a B.S. degree in computer and information science at The Ohio State University College of Engineering.

Thomas B. Hickey
Senior Research Scientist
Office of Research

B.S., Physics, State University of New York at Stony Brook; M.L.S., Library Science, State University College of Arts & Sciences, Geneseo, New York; Ph.D., Library Science, University of Illinois

Dr. Hickey is currently principal investigator for the Electronic Document Delivery project. He has conducted research on the detection of duplicate bibliographic records, the use of search keys in the OCLC Online System, matching personal author name variants, and the development of OCLC's government document search key.

His current interests include digital typeface generation and display, typesetting language translation, the display of documents with graphics, and interactive retrieval systems.

Keith A. Hocter
Programmer
Research Applications

Mr. Hocter is writing communications software and coordinating a field test for the OCLC CD-ROM Retrieval System project.

Before joining the Research Applications group, Mr. Hocter worked in the Marketing and User Services Division, writing software and managing projects. He is pursuing a degree in computer science at The Ohio State University.

Brigitte Kenney
Research Scientist
Office of Research

A.M., University of Chicago

Ms. Kenney is currently principal investigator for the OCLC Database Use Analysis project, which will determine an appropriate subset of the OCLC database to be placed on an optical storage device for cataloging purposes. She is also participating in the Advanced Interface Design for Library Retrieval Systems project by assisting with the design of a user-friendly interface.

Before joining the Office of Research, Ms. Kenney was an independent consultant for library automation and telecommunications.

She was an associate professor at the College of Information Studies, Drexel University, from 1970–77.

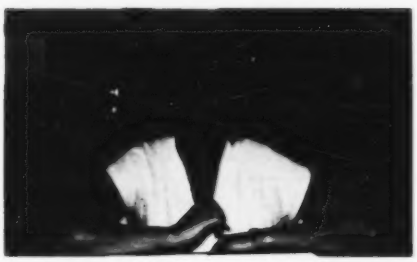
Frederick G. Kilgour
Principal Investigator
EIDOS Project

A.B., Harvard University

Frederick G. Kilgour, currently the Founder Trustee of OCLC, is internationally known and respected for his work and writings in the area of library technology and cooperative networks. As the principal investigator of the EIDOS project, Mr. Kilgour provides the overall direction for project-related activities. He served as president and executive director of OCLC from 1967 to 1980. Before that, he held a number of positions at the Yale University Library, the Yale Medical Library, the U.S. State Department, and the Harvard College Library.

Mr. Kilgour has received numerous awards for his work—most recently the Ohio Governor's Award for Education in 1986. He has also been the recipient of the Medical Library Association's Marcia C. Noyes Award (1984), the ALA Life Membership Award (1982), the American Society for Information Science Award of Merit (1979), the LITA Library and Information Technology Award (1979), and the ALA Melvil Dewey Award (1978). He was a corecipient of the ACRL Academic/Research Librarian of the Year Award for 1979. His professional activities have not been limited to this country, as he has also been involved with the Library Associations of the United Kingdom and Australia.

Mr. Kilgour has received honorary degrees from Marietta College, The Ohio State University, Denison University, and the College of Wooster.



Betsy N. Kiser
Manager
EIDOS Project

B.S., Computer Science, The Ohio State University

Ms. Kiser is currently managing the development of the Electronic Information Delivery Online System (EIDOS) project, which will provide access from microcomputers to the knowledge and data contained in texts.

Prior to becoming section manager, Ms. Kiser worked with Mr. Kilgour as a systems analyst developing the prototype for EIDOS. Earlier experience in the Applications Development Department at OCLC included programming and analysis on various projects relating to the Online Union Catalog (OLUC).

P. Scott Leonard
Research Assistant
Office of Research

B.S., Mathematics and Computer and Information Science, The Ohio State University

Mr. Leonard is developing software for the Electronic Document Delivery project. He is pursuing an M.S. degree in mathematics at the University of California, Los Angeles.

Susan McCabe
Research Assistant
Office of Research

B.A., M.A., Anthropology, The Ohio State University

Ms. McCabe is currently assigned to the Graph-Text project working with graphic characters and the integration of graphics and text.

Ms. McCabe is pursuing a dual Ph.D. degree in anthropology and computer science at OSU.

Michael J. McGill
Vice President
Research and Technical Planning

B.A., Communications, Michigan State University; M.A., Communications Research, Syracuse University; Ph.D., Computer and Information Science, Syracuse University

As vice president of the Offices of Research and Technical Planning, Dr. McGill is responsible for technology assessment, many standards activities, and the conduct and integration of research.

Before joining OCLC in 1983, Dr. McGill held positions as program director for Information Science at the National Science Foundation; senior computer and information science advisor for the U.S. Environmental Protection Agency; and assistant and associate professor and assistant dean for research in the School of Information Studies at Syracuse University.

Karen Markey
Research Scientist
Office of Research

B.A., Art History, The Johns Hopkins University; M.L.S., Information Studies, Syracuse University; Ph.D., Library and Information Science, Syracuse University

Dr. Markey has conducted research in online database coverage, overlap, and redesign; patron use and searching of online databases; subject access to augmented MARC records; and descriptions of subject contents of visual materials. As principal investigator of the Dewey Decimal Classification Online Project, she demonstrated that the DDC enhanced subject access and subject searching strategies in online catalogs and the display of subject information in bibliographic records.

Before joining OCLC in 1981, Dr. Markey was involved in several areas of research for the ERIC Clearinghouse on Information Resources and the School of Information Studies at Syracuse University.

Lillian Moon
Administrative Coordinator
EIDOS Project

Ms. Moon is the administrative coordinator for Mr. Kilgour and the EIDOS project staff.

Before joining OCLC in June, 1986, Ms. Moon was employed at Celina Insurance Group. She achieved her Certified Professional Secretary (CPS) rating in 1981 by passing an examination sponsored by Professional Secretaries International.

Bruce L. Mortland
Programmer/Analyst
Office of Research

B.S., Computer Technology, Youngstown State University

Mr. Mortland is studying new technologies, artificial intelligence, and human-computer interaction with specific application to the Advanced Interface Design project.

Prior to joining OCLC, Mr. Mortland was employed by several small systems consultants in Youngstown, Ohio.

Lora J. Nelson
Programmer/Analyst
Office of Research

B.S., Computer and Information Science, The Ohio State University

Ms. Nelson is developing typesetting software for the Electronic Document Delivery project.

Before joining the Office of Research, Ms. Nelson worked as a programmer for the Political Science Department at The Ohio State University.

Terry Noreault
Senior Research Scientist
Research Applications

B.A., Computer Science, State University of New York at Oswego; Ph.D., Information Transfer, Syracuse University

Before joining OCLC in 1985, Dr. Noreault was an assistant professor of information science at the University of Pittsburgh. Prior to that, he was an assistant professor in computer science at Colgate University.

Dr. Noreault's research interests are in information retrieval. His published works are in the areas of ranking algorithms and efficient techniques to calculate statistical relationships between terms.

Edward T. O'Neill
Senior Research Scientist
Office of Research

B.A., Industrial Engineering, Albion College; B.S., M.S., Ph.D., Industrial Engineering, Purdue University

Dr. O'Neill coordinates much of the research and development for authorities and authority control. He also is involved in the investigation of error correction techniques, collection analysis, index evaluation, database organization, and optical data storage.

Before joining OCLC in 1983, Dr. O'Neill was dean of the Matthew A. Baxter School of Information and Library Science at Case Western Reserve University. Prior to that, he was an associate professor in the School of Information and Library Studies at the State University of New York at Buffalo. As a former OCLC Visiting Scholar, Dr. O'Neill participated in a variety of research projects, including an examination of various methods of providing subject access to large bibliographic databases.

W. Mike Oskins
Associate Scientist
Office of Technical Planning

B.M.E., Music Education, University of Evansville; B.A., Mathematics, University of Evansville; M.S., Computer Science, University of Southwestern Louisiana

Mr. Oskins was in charge of database creation for the CD-ROM Retrieval System project. He also monitors developments in the areas of optical storage, interactive audio systems, and artificial intelligence.

Prior to transferring to the Office of Technical Planning, Mr. Oskins worked in the Office of Research investigating knowledge-based systems, experimenting with natural language interfaces for information retrieval systems and the creation of prototype expert systems.

Mr. Oskins also worked in OCLC's Product Development Division. Prior to joining OCLC, he was application systems analyst/programmer and statistician for The Ohio State University College of Medicine.

Debra A. Pawlicki
Research Assistant
Office of Research

B.A., History, Illinois Benedictine College; M.B.A., DePaul University

Ms. Pawlicki is currently developing and testing programs utilizing the design language being developed for the Advanced Interface Design for Library Retrieval Systems project and writing design language documentation.

Prior to joining the OCLC Office of Research, Ms. Pawlicki worked as a course developer and instructor for AT&T Technologies and as a communications systems representative for AT&T Information Systems.

Ms. Pawlicki is completing her graduate work in computer and information science at The Ohio State University.

Kym Pocius
Research Assistant
Office of Research

B.S., Psychology, The Ohio State University; M.S., Psychology, Virginia Polytechnic Institute and State University

Since joining the OCLC Office of Research, Ms. Pocius has helped maintain a current awareness technology database. She has also monitored certain areas of research interest for the Office of Research.

She is pursuing a Ph.D. degree in psychology at The Ohio State University.

Chandra G. Prabha
Associate Research Scientist
Office of Research

B.Sc., Math, Physics, and Chemistry, Osmania University (India); B.S., Education, University of Wisconsin; M.S., Library Science, University of Wisconsin; Ph.D., Library and Information Science, University of Illinois

Dr. Prabha is currently engaged in the Nonfiction Book Use by Public Library Users project. Her project activities include identifying the kind of information library patrons seek in nonfiction books and the use to which they put this information.

Before joining OCLC, Dr. Prabha conducted research in bibliometrics. Her extensive library experience includes appointments at the University of Wisconsin-Madison, Milwaukee Public Library, International Crops Research Institute for Semiarid Tropics, University of Hyderabad, and the American Studies Research Centre. As an OCLC Postdoctoral Fellow, Dr. Prabha was responsible for the Distinguished Seminar Series program for 1985/86.

Michael J. Prasse
Research Assistant
Office of Research

B.A., Mathematics and Psychology, University of Southern California; M.A., Experimental Psychology, University of Southern California

Mr. Prasse conducts research on the human factors issues pertaining to the presentation of information on a display screen. He also evaluates the cognitive and perceptual implications of reading text from a terminal.

Mr. Prasse is a member of the Display Formats project and participates in research for the EIDOS project.

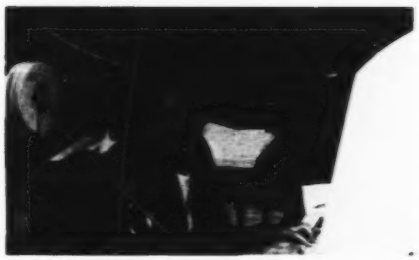
Before coming to OCLC, Mr. Prasse was a teaching assistant in the Psychology Department at The Ohio State University and an administrative assistant doing statistical analysis for the OSU graduate school. He is pursuing a Ph.D. degree in cognitive psychology at The Ohio State University.

Rebecca H. Purdy
Administrative Assistant to the Vice President
Research and Technical Planning

Ms. Purdy is responsible for overall administration of Research and Technical Planning. Her responsibilities include budget preparation and monitoring, conference planning, project coordination, and personnel administration.

Ms. Purdy joined OCLC in 1978 as secretary for the Office of Research. Since that time, she has held positions within Research, Development, and the Executive Office.

Ms. Purdy is pursuing a degree in information and records management.



Karen J. Rankey
Programmer/Analyst
Office of Research

B.S., Computer and Information Science, The Ohio State University

Ms. Rankey designs databases for the Advanced Interface Design for Library Retrieval Systems project. She also designs software for investigation of human factors of information systems use.

Prior to joining OCLC, Ms. Rankey was employed by The National Center for Research in Vocational Education in Columbus.

Anthony M. Repka
Programmer/Analyst
Office of Research

B.A., Geography, Bowling Green State University; M.S., Computer Science, Bowling Green State University

Mr. Repka is designing and implementing features of the design language being developed for the Advanced Interface Design for Library Retrieval Systems project. He is also investigating related human-computer interaction issues.

Prior to joining OCLC, Mr. Repka was employed as a programmer for the Department of Psychology at Bowling Green State University.

Amy Rhine
Research Assistant
Office of Research

Ms. Rhine helps prepare the graphics for journal articles used in the Graph-Text project.

Before joining OCLC, Ms. Rhine was employed by General Motors as an engineering intern and by General Dynamics as an engineering trainee.

Ms. Rhine is pursuing her B.S. degree in industrial engineering at The Ohio State University.

Duane A. Rice
Research Assistant
Office of Research

B.S., Industrial Design, The Ohio State University

Mr. Rice is assigned to the Nonfiction Book Use by Public Library Users project, performing data collection and analysis activities to discover trends in library book usage for application to future OCLC products.

Mr. Rice is currently working on an M.A. degree in industrial design at The Ohio State University.

Michele Stambersky
Secretary
Office of Research

Ms. Stambersky has been a secretary in the Office of Research since October of 1985.

Before coming to OCLC, Ms. Stambersky worked as a secretary in the Department of Psychology and the Department of Pediatrics and Human Development at Michigan State University.

Mary C. Taylor
Research Information Specialist
Office of Research

B.A., History, University of Illinois

Ms. Taylor directs the Research Intelligence Program and the Library School Research Equipment Support Program for the Office of Research. She also manages an in-house technology awareness database for the Office of Technical Planning.

Michael Teets
Research Assistant
Office of Research

B.A., Computer and Information Science, The Ohio State University

Mr. Teets is currently writing programs for the Advanced Interface Design for Library Retrieval Systems project and working on data premastering for the OCLC CD-ROM Retrieval System project.

John E. Tolle
Research Scientist
Office of Research

B.S., M.S., Mathematics, The Ohio State University; Ph.D., Systems Engineering, The Ohio State University

Dr. Tolle is currently project manager of the Display Formats project and is actively involved in the area of human-computer interaction. Previously, he has been project manager for a number of projects, including Transaction Analysis and Simulation, Advanced Interface Design for Library Retrieval Systems, CONSER Abstracting and Indexing Overlap Study, Current Utilization of Online Catalogs, and Terminal Requirements for Online Catalogs in Libraries. Dr. Tolle's areas of interest include human factors, interface and display design, user models (performance and behavior), and performance measurement and evaluation of information systems.

Prior to joining OCLC, Dr. Tolle taught and conducted research at Carnegie-Mellon University, Battelle Columbus Laboratories, and the Institute for Research in State College, Pennsylvania. He has been an adjunct professor at The Ohio State University.

Howard Turtle
Director
Office of Technical Planning

B.A., English/Mathematics, University of Wisconsin; M.S., Computer Science, University of Wisconsin

As director of the Office of Technical Planning, Mr. Turtle is responsible for technology assessment activities, coordinating work on national and international technical standards, and providing technical input to and review of OCLC development and strategic plans. His principal research interests include mass storage and information retrieval architectures, advanced processor technologies, and the implications of distributed architectures, particularly those based on OSI (Open Systems Interconnection) protocols.

Before moving to the Office of Technical Planning, Mr. Turtle was a senior research scientist in the Office of Research, where he directed the Human-computer Interaction program and was actively involved in the Electronic Document Delivery project and Distributed Processing program.

Prior to joining OCLC, Mr. Turtle was a research scientist at Battelle Columbus Laboratories, specializing in the design and implementation of information retrieval software and the analysis of telecommunications networks.

David R. VanVoorhis
Research Assistant
Office of Technical Planning

Associate Degree, Electronic Engineering, Hocking Technical College

Mr. VanVoorhis is currently working on various methods of compressing data for use on compact disc-based information retrieval systems. In addition, Mr. VanVoorhis is testing the performance of several different types of optical storage devices.

Prior to joining OCLC, Mr. VanVoorhis was a communications engineering technician for American Electric Power Service Corporation and an electronics technician at Ohio University.

Mr. VanVoorhis is presently pursuing a B.S. degree in electrical engineering at The Ohio State University.

Diane Vizine-Goetz
Research Scientist
Office of Research

B.A., English, State University of New York at Buffalo; M.L.S., Information and Library Studies, SUNY at Buffalo; Ph.D., Information and Library Science, Case Western Reserve University.

Dr. Vizine-Goetz is currently project manager of the Classification Analysis Project, which is concerned with mapping the Library of Congress and Dewey Decimal Classification systems to improve subject retrieval in online catalogs. She is also coinvestigator of a project investigating the development of a prototype expert system for online book cataloging.

Dr. Vizine-Goetz first joined the Office of Research in late 1981 as a research assistant, assisting in a research project to automatically correct errors in LC subject heading fields of OCLC records. She continued this research in 1983 and 1984 as OCLC's first postdoctoral fellow.

Stuart L. Weibel
Associate Research Scientist
Office of Research

B.S., Biology, Ohio Dominican College; Ph.D., Pharmacology, The Ohio State University

Dr. Weibel's research interests are presently focused on the application of artificial intelligence to problems in information science.

Prior to joining OCLC, Dr. Weibel chaired the Biology Department and taught biology at Ohio Dominican College. His computer experience includes development of computer-aided instruction materials, automated laboratory data collection, and statistical analysis.

Igor Zuyev
Systems Analyst I
EIDOS Project

B.S., Physics, Moscow State University, USSR

Mr. Zuyev designs software for the Electronic Information Delivery Online System (EIDOS) project.

Prior to joining OCLC, Mr. Zuyev worked as a research associate at Carnegie-Mellon University and as systems analyst for Business Information Technologies in Tennessee.

OCLC Online Computer Library Center, a nonprofit membership organization, is engaged in computer library service and research and makes available computer-based processes, products and services for libraries and other educational organizations. From its facility in Dublin, Ohio, OCLC operates an international computer network that libraries use to acquire and catalog books, order custom-printed catalog cards and machine-readable records for local catalogs, arrange interlibrary loans, maintain location information on library materials, and gain access to other databases. Over 6,000 libraries in the United States and sixteen other countries contribute and use information in the OCLC Online Union Catalog, the world's largest database of library bibliographic information. OCLC also provides local decentralized computer systems and standalone microcomputer-based systems for individual libraries or clusters of libraries.

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